

Dash™ 2500 Patient Monitor Operator's Manual



Dash™ 2500 Patient Monitor

Operator's Manual



NOTE: In addition to software version RAK, the information in this manual also applies to the old Dash 2500 Patient Monitor software version. There are no user-apparent differences among these software versions. Due to continuing product innovation, specifications in this manual are subject to change without notice.

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1 Introduction

For your notes

Description

The Dash 2500 Patient Monitor is a portable (intra-hospital) multi-parameter monitor designed for monitoring adult, pediatric, and neonate patient vital signs. The Dash 2500 Patient Monitor is self-contained and can be powered by batteries or AC. The Monitor has a carrying handle and can be operated on a shelf or table. It can also be mounted in a variety of ways (e.g., wall, pole, bed rail, or head/foot board) using a mounting plate located on the bottom of the Monitor. The Monitor can be used as a stand-alone monitor with the capability to interface to a central station, a server or any other device capable of receiving data using the host communications protocol.

Indications for Use

The Dash 2500 Patient Monitor is intended for use under the direct supervision of a licensed healthcare practitioner. The intended use of this device is a portable (intra-hospital) multiparameter unit designed for monitoring adult, pediatric, and neonate patient vital signs in a hospital subacute care environments, such as same-day surgery, emergency rooms, recovery/PACU, progressive care, interventional radiology, special care units, and GI/endoscopy.

The Dash 2500 Patient Monitor monitors and displays oscillometric non-invasive blood pressure (systolic, diastolic and mean arterial pressure), heart/pulse rate, respiration rate, ECG, temperature with an reusable electronic thermometer (predictive mode for oral and rectal temperature measurement, monitor mode for axillary temperature measurement), and functional oxygen saturation (SpO₂) and pulse rate via spot checking and continuous monitoring, including monitoring during conditions of clinical patient motion or low perfusion.

The Dash 2500 also detects alarm limit conditions and is capable of recording up to two waveforms. Using this monitor a clinician can view, record and recall clinical data derived from each parameter.

Contraindications

- This device is not designed, sold, or intended for use except as indicated.
- Federal law (U.S.A.) restricts this device to sale by or on the order of a physician.

WARNINGS

If cables and hoses are pulled with sufficient force, unsecured monitors may fall causing injury or equipment damage. To PREVENT injury or equipment damage, install the Monitor with mounting hardware recommended by GE Medical Systems *Information Technologies*.

WARNINGS

Do not use the Dash 2500 Patient Monitor in the presence of magnetic resonance imaging (MRI) devices. There have been reports of sensors causing patient burns when operating in an MRI environment.

To help prevent burns caused by unintended current return paths with the use of high frequency (HF) surgical equipment, ensure that the HF surgical neutral electrode is properly connected.

To avoid personal injury, do not perform any servicing unless qualified to do so.

Disconnect the power supply and remove the battery before servicing.

To reduce the risk of electric shock, do not remove the cover or the back of the unit. Refer servicing to a qualified service person.

If the accuracy of any determination reading is questionable, first check the patient's vital signs by alternate means, and then check the Dash 2500 Patient Monitor for proper functioning.

PACEMAKER PATIENTS: Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. Keep pacemaker patients under close surveillance. See this manual for disclosure of the pacemaker pulse rejection capability of this instrument.

VENTRICULAR ARRHYTHMIA: The arrhythmia analysis program is intended to detect ventricular arrhythmias. It is not designed to detect atrial or supraventricular arrhythmias. Occasionally it may incorrectly identify the presence or absence of an arrhythmia. Therefore, a physician must analyze the arrhythmia information in conjunction with other clinical findings.

SUSPENDED ANALYSIS: When arrhythmia analysis is turned on, conditions that suspend ECG processing also suspend arrhythmia analysis. No detection of arrhythmia conditions or associated alarms are given when arrhythmia analysis is suspended. Arrhythmia analysis can be turned off by the user. When it is, the message ARR OFF appears in the ECG waveform area.

CAUTIONS

Arrange the power cord, air hoses, and all cables carefully so they do not constitute a patient strangulation, entanglement, or tripping hazard.

Verify calibration and ensure that the Dash 2500 Patient Monitor is functioning properly before operating it.

Perform regular functional testing of each of the parameters, using the accessories supplied with the Dash 2500 Monitor.

Allow for heat dissipation by ensuring that the vent in the rear is unobstructed.

Do not gas sterilize or autoclave.

When the installation or arrangement integrity of the external earth conductor is in doubt, operate equipment from its internal battery until this condition can be corrected.

Unplug the Monitor before transport.

NOTES

- Waveforms may be distorted and readings inaccurate when electrosurgical cautery equipment is used while monitoring with the Dash 2500 Patient Monitor.
- The electromagnetic compatibility profile of the Dash 2500 Patient Monitor may change if accessories other than those specified for use with the Dash 2500 Patient Monitor are used.

Product Compliance

The Dash 2500 Patient Monitor is classified in the following categories for compliance with IEC 60101-1:

- Class I, internally powered
- Transportable (intra-hospital)
- For continuous operation
- Not suitable for use in the presence of flammable anesthetics
- Not for use in the presence of an oxygen-enriched atmosphere (oxygen tent)
- Type BF and type CF applied parts
- Defibrillation protected. When used with the GE Medical Systems *Information Technologies*-recommended accessories, the Monitor is protected against the effects of defibrillator discharge. If monitoring is disrupted by the defibrillation, the Monitor will recover.
- This equipment is suitable for connection to public mains as defined in CISPR 11..
- This Monitor conforms to general safety standard for medical devices to IEC

60601-1.

- This Monitor conforms to particular safety standard for multifunction patient monitoring equipment to IEC 60601-2-49.
- This Monitor conforms to usability safety standard for medical devices to IEC 60601-1-6.
- This Monitor conforms to EMC safety standard to IEC 60601-1-2.
- Software is developed in accordance with IEC 60601-1-4.
- The ECG parameter conforms to IEC 60601-2-27.
- The NIBP parameter conforms to IEC 60601-2-30, EN 1060-1, EN1060-3, ANSI/AAMI SP10.
- The TEMP parameter conforms to the accuracy defined in ASTM E 1112.
- The application of risk management analysis to medical device conforms to ISO 14971.
- The alarm systems of the Monitor conform to IEC 60601-1-8.

NOTE: The alarm systems of the Monitor conform to IEC 60601-1-8: 2003 with the exception of Sub-clauses 201.3.2.2b and 201.3.3.1a:

- ◆ The visual alarm indications do not display with different colors, and do not flash at different rates.
- ◆ For warning priority and procedural priority alarms, the pulse spacing and repeat time of auditory alarm are tighter than as specified.

WARNING

These exceptions occur due to efforts to improve the readability of the display and to reduce eyestrain, and Red is much more distinguishable to user than Yellow. In consultation with clinical practitioners, the pulse spacing and repeat time of auditory alarm are deemed to be more appropriate. However, the section 4 Alarm shall be read carefully to prevent any potential hazard.

- The ECG parameter conform to ANSI/AAMI EC13.

NOTE: The ECG parameter conforms to ANSI/AAMI EC13: 2002 with exception of Sub-clauses 4.1.4.2 and 4.2.6.1 QRS detection.

WARNING

In clinical conditions, it is reasonable to assume that spurious signals of this type are either random in occurrence, or related to pacemaker activity. The arrhythmia analysis algorithm is designed to factor the randomness of spikes into its rejection logic, and this randomness is not exercised in the above referenced testing. The algorithm does correctly reject pace signals as prescribed by EC13.

- The SpO₂ parameter conforms to ISO9919 with the exception Sub-clauses 44.6 Ingress of liquids

WARNING

This clause identifies a use case of an oximeter used in an operating room on top of an anaesthesia machine and the possibility of the oximeter being wetted by IV or body fluids. The the intended use for the Dash 2500 does not include the operating room and it would not likely be expose to this environment.

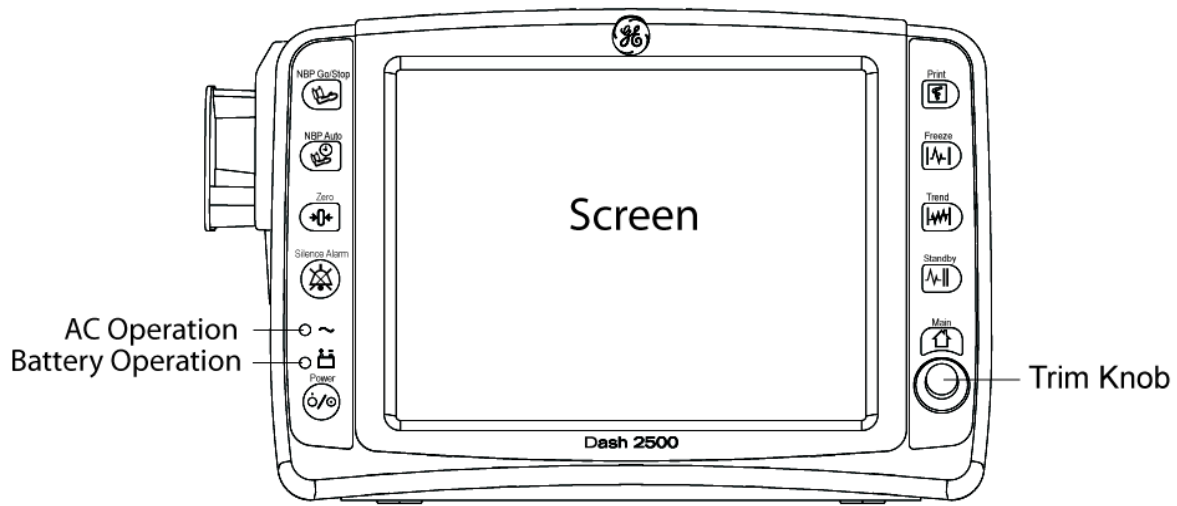
A basic level of fluid ingress including the 200ml spill test prescribed in the standard has been established through compliance with IEC60601-1-1988 standard, this establishes a basic level of protection for the device. This risk has been addressed in detail in the risk and hazard analysis document.

Do not allow fluids to come in contact with the Monitor. If fluids are accidentally spilled on the Monitor, remove affected unit from service as soon as possible. Contact GE Medical Systems Information Technologies Technical Support to ensure there is no compromise in electrical safety.



This product conforms with the essential requirements of the Medical Device Directive 93/42. Accessories without the CE mark are not guaranteed to meet the Essential Requirements of the Medical Device Directive.

2 Product Overview



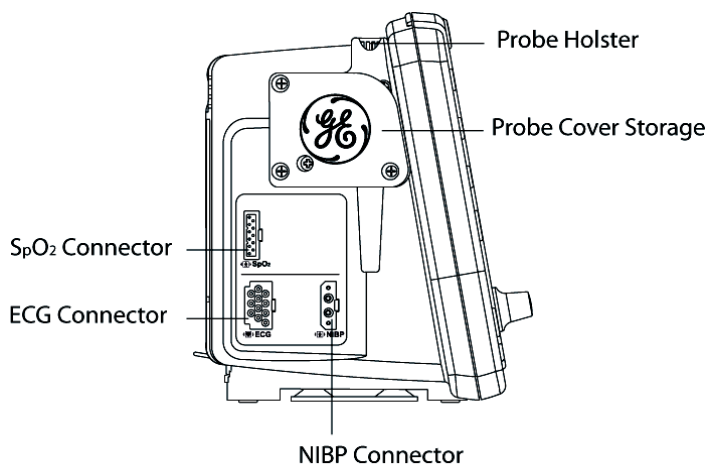
Front of Dash 2500 Patient Monitor

Description

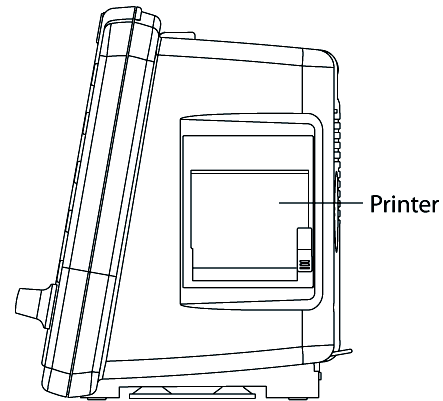
The Dash 2500 Patient Monitor—which is capable of monitoring adult, pediatric, and neonatal patients—consists of a monitor and a power cord. Using the hardkeys on the Monitor, you can quickly and easily silence alarms, obtain NIBP readings, print data, freeze a waveform, enter standby mode or trends and return to the main screen.

Monitor

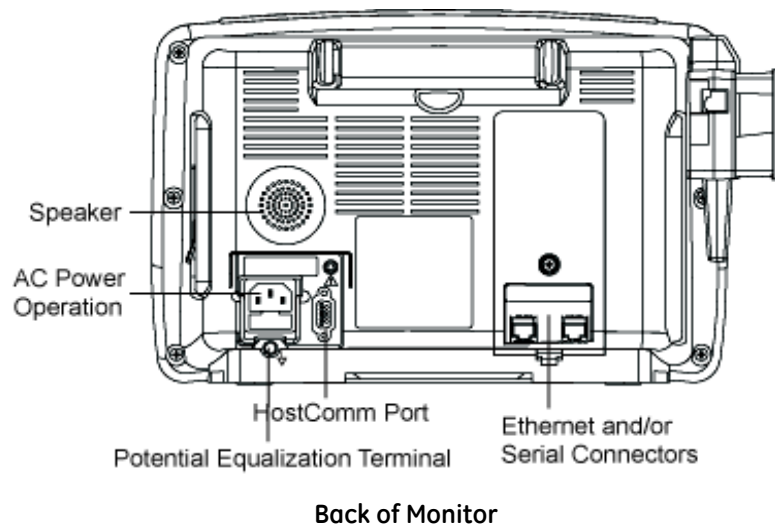
The Dash 2500 Patient Monitor is self-contained and has a carrying handle. It can be operated from internal battery or AC (via a power cord). All patient connectors are on the Monitor. On the front of the Monitor are the **Power** button, the hardkeys, and the AC/battery power indicators. On the back of the Monitor are the power supply connections, and device connections, and speaker. On the bottom of the Monitor is the mounting plate. On the side of the Monitor are all of the parameter connectors. The Dash 2500 Patient Monitor provides connections for information exchange to other devices/systems, remote alarm. The internal battery is capable of powering the Dash 2500 Patient Monitor for more than 180 minutes.



Left side of Monitor



Right Side of Monitor

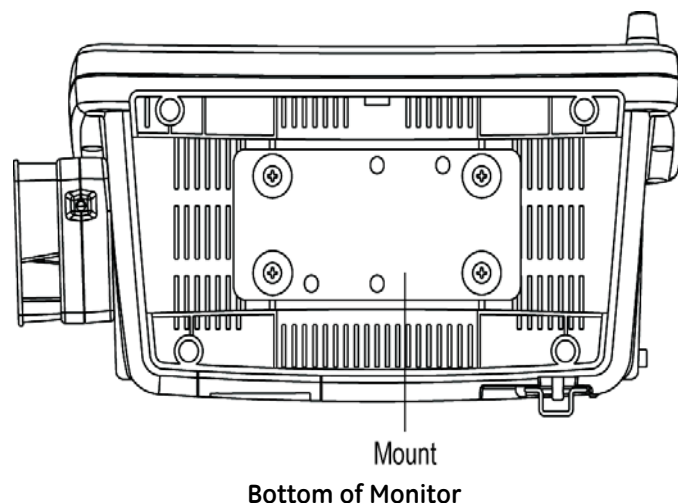


Parameters

Dash 2500 Patient Monitor measures the various parameters of a patient's vital signs and the Recorder/Printer provides a thermal paper strip recording. The waveforms and parameter measurements on the screen vary according to the parameters that are active in the Dash 2500 Patient Monitor. The parameters include noninvasive blood pressure (NIBP), ECG, respiration, predictive temperature, and SpO₂.

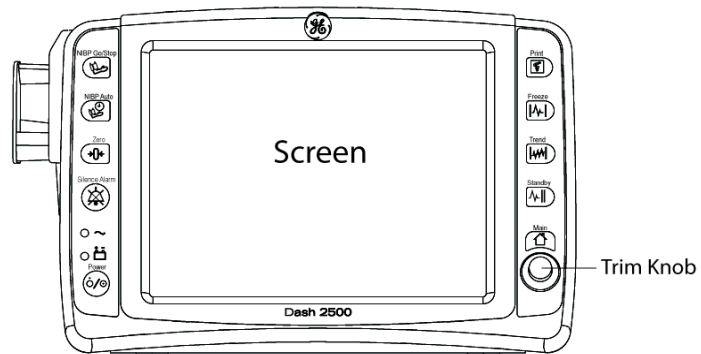
Mounting the Dash 2500 Patient Monitor

The Monitor is self-contained and portable (intra-hospital). You can mount it in a variety of ways (e.g., shelf, countertop, table, wall, pole, bed rail, or head/foot board) using an accessory mount located on the bottom.



Display

The color display can show a maximum of five waveforms and multiple parameter values and menus. You can use the Trim Knob, hardkeys, and information on the screen to interact with the Dash 2500 Patient Monitor.



Display

Trim Knob

The Trim Knob is a rotary knob with push-button action. Rotating it allows you to navigate through the menus, while pushing it allows you to choose menu options. You can also use the Trim Knob as a shortcut for closing menus by pushing and holding the knob for 2 seconds, which acts the same as the **Main** hardkey.

Hardkeys

Each of the push-button hardkeys activates specific functions. Hardkeys that have double functions are activated by either a quick-push or a push-and-hold. A quick-push means that the hardkey must be pressed for *less* than 1 second. A push-and-hold means that the hardkey must be pressed for *more* than 1 second. A confirmation tone sounds when the hardkey becomes active.



NIBP Go/Stop - starts and stops any determination of noninvasive blood pressure.



NIBP Auto - is a dual-function hardkey. Starts auto BP determinations by a single-press and gives you access to change the NIBP cycle time. Starts stat determinations pressing and holding the key down (5 minutes of continuous NIBP cycles).



Zero - zeros the IBP determination. This hardkey is available only for use when IBP is configured. IBP is not configured in Dash 2500.



Silence Alarm - temporarily silences alarms; acknowledges alarming crisis conditions.



Power - turns Monitor off and on.



Print - prints a snapshot (timed recording) with a single-press. Pressing and holding the key down allows for a continuous recording of the chosen waveforms.



Freeze - captures up to 16.8 seconds of waveforms on the screen. The number of seconds varies depending on the selected sweep speed.



Trend - enters and exits trends (view patient trends data). This hardkey can be configured through the configuration mode to display two different views: mini trends or full trends.



Standby - enters and exits standby mode.



Main - closes the menu system and takes you back to the main screen.

Optional Components

NOTE: Interconnected equipment must be installed by a qualified service person. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for instructions.

Symbols

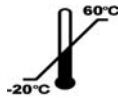
The following symbols are associated with the Dash 2500 Patient Monitor.



ATTENTION: Consult accompanying documents before using the equipment.



Battery in use



Storage temperature



Alternating current (AC)



Packaging label depicting the transportation and storage atmospheric pressure range of 500 to 1060 hPa.



This side up



Keep dry



Fragile, handle with care



Predictive temperature



Defibrillator-proof type BF equipment; type BF equipment is suitable for intentional external and internal application to the patient, excluding direct cardiac application. Type BF equipment is type B equipment with an F-type isolated (floating) part. The paddles indicate the equipment is defibrillator proof.



Defibrillator-proof type CF equipment; type CF equipment is specifically designed for applications where a conductive connection directly to the heart is established. The paddles indicate the equipment is defibrillator proof.



Potential Equalization Terminal: Terminal for providing a connection between the equipment and the potential equalization busbar of the electrical installation.



WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE): This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.



Manufacturer: This symbol is accompanied by the name and the address of the manufacturer.



Manufacturing Date: This symbol is accompanied by the date of the manufacturing.



This product consists of devices that may contain mercury, which must be recycled or disposed of in accordance with local, state, or country laws. (Within this system, the backlight lamps in the monitor display contain mercury.)



This product get an Nationally Recognized Testing Laboratory (NRTL) approve based on United States standard UL 60601-1:2003 and Canada standard CAN/CSA-C22.2 No. 601.1-M90.

Specifications

Specifications	
Mechanical	
Monitor	8.7 in (H) x 6.7 in (D) x 14.1 in (W) 22.0 cm (H) x 17.0 cm (D) x 35.8cm (W)
Weight	
Dash 2500 Patient Monitor	12 lb (5.5 kg)
Environmental*	
Operating Temperature	+41°F to +104°F (+5°C to +40°C)
Storage and Transportation Temperature	-4°F to +140°F (-20°C to +60°C)
Operating Humidity	5% to 95% noncondensing
Storage and Transportation Humidity	5% to 95% noncondensing
Operating Atmospheric Pressure	700 hPa to 1060 hPa
Storage and Transportation Atmospheric Pressure	500 hPa to 1060 hPa
Electrical	

Specifications	
AC Input Voltage	100-240 V
AC Input Frequency	50/60 Hz
AC Input Power	120 VA
Internal Battery	8.4 V nickel-metal-hydride (NiMH)
Power Supply	The Dash 2500 Patient Monitor can be powered from the internal battery or AC power.
Battery	An internal, rechargeable battery pack powers the Monitor for greater than 180 minutes at a specified load. The battery typically charges to full capacity within 4 hours when power off.
Power Cable	The power cable is detachable.
* The Monitor may not meet Performance Specifications (ANSI/AAMI SP10) if it is stored or used outside of the specified ranges of environmental parameters.	
Fuses	
Internal	
FS1	0.5 amp, 60V, auto-reset
FS2	1.85 amp, 60V, auto-reset
FS3	10 amp, 250V, fast acting, not resettable
FS4	0.5 amp, 60V, auto-reset
FS5	0.1 amp, 60V, auto-reset
External	
FS	1amp, 250V, not resettable
FS	1amp, 250V, not resettable

3 Using the Dash 2500 Patient Monitor

For your notes

Basic Operation

You can turn on the Dash 2500 Patient Monitor by pushing either the **Power** button or the Trim Knob when it is plugged into AC power. If the Monitor is using battery power, it can be turned on only by the **Power** button on the front of the unit. Once the Monitor is turned on, the name of each parameter in the Monitor appears as an option under the **Setup parameters** option in the **Main Menu**. When each parameter is ready to begin monitoring, a dedicated portion of the screen is labeled with the parameter name.

On power-up, the Monitor performs the following steps in the order listed:

- At initial power up, the fail safe alarm sounds briefly.
- All indicator lights switch on.
- The screen momentarily displays the GE Medical Systems *Information Technologies* logo.
- The Monitor performs a self-test — the screen displays the model and revision number of the Monitor — and a start-up tone sounds.
- The main waveform screen appears.

When all the above steps are performed, it indicates that the Monitor is ready for use.

How to turn on the Monitor and begin monitoring

1. Ensure AC power is plugged in and the internal battery has been fully charged.
2. Turn on the Monitor. The introductory screen displays the software version briefly.
 - a. When using AC, you can either push the Trim Knob or the **Power** hardkey.
 - b. When using the battery, the Monitor can be turned on only by the **Power** hardkey.
3. The waveform screen automatically appears with a popup window and the message, **CAUTION! Alarms are temporarily disabled while patient connections are re-established. Is this a new patient you would like to admit?** Choose **yes** or **no**. If you choose **Yes**, the Monitor performs an admission (refer to Admit Patient section for more information).
4. Ensure that the necessary cables are connected to the Monitor.
5. Ensure that the necessary cables, transducers, and sensors are connected to patient.

WARNINGS

Medical technical equipment such as this monitor/monitoring system must only be used by persons who have received adequate training in the use of such equipment and who are capable of applying it properly.

The Monitor should only be used on one patient when monitoring, the simultaneous use of other patient of the equipment may cause safety hazard.

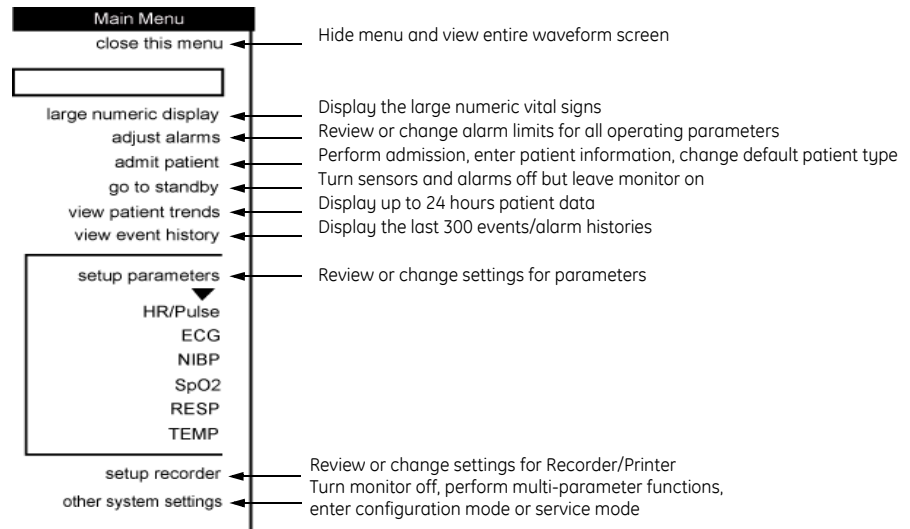
When the Monitor gets wet accidentally, power off the Monitor and unplug the power cord.

Menus

You can perform most functions on the Dash 2500 Patient Monitor by using menus, which appear on the left side of the screen. The **Main Menu** options and their major functions are shown in the following figure. When you choose options from the **Main Menu**, you gain access to secondary menus that provide you with additional options for setting monitoring parameters and managing patient data.

NOTES

- You can access the **Main Menu** by pushing or turning the Trim Knob. Some events will also cause the **Main Menu** to automatically appear.
- The menu on the screen automatically closes if there has been no user-interaction for 2 minutes. However, the menu stays open if: 1) the *SelectBox* is active, 2) the freeze feature is active, 3) a monitor mode temperature determination is in progress, or 4) an adjuster menu option is open.
- Pushing and holding the Trim Knob for 2 seconds closes the menu as long as: 1) the *SelectBox* is not active, 2) the **Freeze** hardkey is not active, 3) a monitor mode temperature determination is not in progress, or 4) an adjuster menu is not open.
- Instructions for the **go to standby** option and for turning off the Monitor are in this section of the manual. Instructions for the other menu options are in sections dealing specifically with their function.

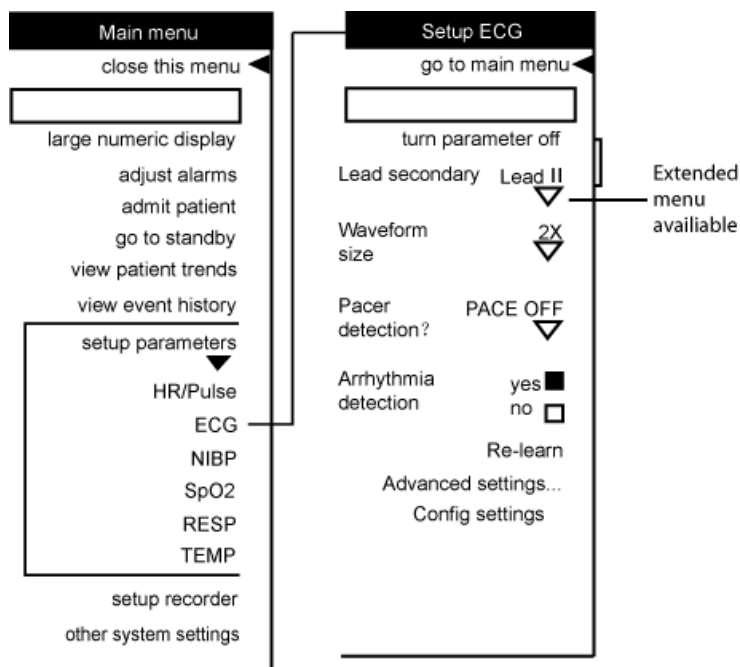


Main Menu Options and Their Functions

Menu Options

In the **Main Menu** and in most secondary menus, extended menus are a means of accessing additional options. The **Main Menu** has one extended menu (**Setup parameters**), and most secondary menus have one or more extended menus. For example, the **Setup ECG** menu (shown in the figure) has three extended menus. An extended menu is signified by a ▽ symbol under the menu option. When you choose the ▽ symbol, an extended menu appears, and you can then choose from the available options. Some menus contain **adjuster menu options** that appear as a number with a box around it, which is user selectable. Some menus contain an arrow that appears at the bottom or top of a menu indicating that there are more menu items available if you scroll in the direction the arrow is pointing.

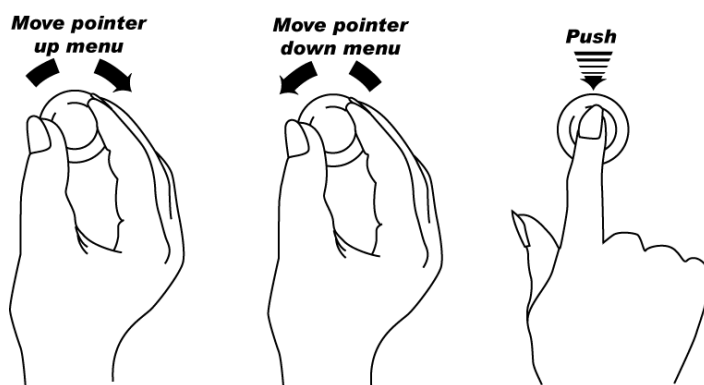
Associated menus, signified by "...", are accessed from secondary menus and offer related menu options. **Advanced settings** and **Config settings** (configuration settings) are associated menus. Once a menu option with an ellipsis is accessed, a new menu appears. You can access the **advanced settings** menu at any time during basic operation. The **Config settings** menu can be viewed in basic operation, but you must be in the password-protected configuration mode to change these settings.



Relationship of Main Menu to Secondary Menus

Accessing and Using Menu Options

The Trim Knob lets you navigate through the menus and choose among the various options for patient monitoring and data management, as well as turning the Monitor on. You can also use the Trim Knob as a shortcut for closing menus by pushing and holding it for 2 seconds, which acts the same as the **Main** hardkey. If you choose a menu option that is unavailable, the Monitor sounds a double-tone indicating its unavailability.



Using the Trim Knob

How to navigate through menus

1. To navigate through the menu options, rotate the Trim Knob.
2. Turn the knob clockwise to move the pointer up the menu.
3. Turn the knob counterclockwise to move the pointer down the menu.
4. To choose a menu option, push the Trim Knob.
5. To close all open menus, push and hold the Trim Knob for 2 seconds.

Menu options make it possible for you to:

- Choose **yes** or **no** in response to a question such as **View waveform?**
- Choose only one item from a list. For example, you can choose a respiratory sweep speed of **6.25 mm/s**, **12.5 mm/s**, or **25.0 mm/s**.
- Adjust values. For example, when monitoring NIBP you can change the values for the high and low alarm limit for systolic, diastolic, and mean blood pressures.

Display Screen

Color Format

This option lets you choose to use **mono**, **limited color**, or **full color** on your monitor screen. **Mono** settings use only amber and deselected yellow. **Limited color** settings use only amber, deselected yellow, green, and red. **Full color** settings use amber, yellow, deselected yellow, red, magenta, light green light blue and white.

NOTE: When changing the color format from **full color** to **mono** and back to **full color** again, the **full color** setting will be restored to its previous **full color** setting.

How to select color format

1. Go to the **Advanced settings** menu in the **other system settings** menu. In the **Advanced settings** menu, choose **Select color format**.
2. A box appears around the current setting. Turn the Trim Knob to change the setting.
3. Push the Trim Knob to confirm the new setting.

Display Colors

When using the Dash 2500 Patient Monitor, a selection of eight colors are available for use on the display. You can choose from yellow, red, magenta, light green, green, light blue, blue, and white. You can choose a different color for each waveform and its associated values and labels.

NOTES

- To have access to all available colors, the **full color** option must be chosen in the **Select color format** option.
- Since the HR/Pulse value can be derived from several sources (ECG, SpO₂ and NIBP), you may want to display the HR/Pulse information in the same color as its current source. To do this, choose the **Setup HR/Pulse** menu and open the **Advanced settings** menu. Choose **yes** for the **Change color based on source?** option.

How to change display colors

1. In the Setup menu of the parameter for which you wish you to change colors, choose **Select XXX's color** in the **Advanced settings** menu. (XXX = parameter name.)
2. A box appears around the current color setting. Turn the Trim Knob to change the color setting.
3. Push the Trim Knob to confirm the new setting.

Screen

During normal operation of the Monitor, you will see two major types of screens on the display: waveform screens and menu screens. A waveform screen shows you data for the current patient, including vital signs, waveforms, and alarm messages. A menu screen displays current patient data and also lets you perform tasks such as admitting a patient, changing parameter settings, and viewing the event history.

You will see these symbols on the screens.

▽ The symbol ▽ signifies that an extended menu is available.

▼ The symbol ▼ signifies that an extended menu is open.

▬ The SpO₂ Bar indicates the strength or quality of the signal detected by the SpO₂ parameter.

♥ The heart symbol blinks once for every heart beat detected.

••• The ellipsis appears adjacent to the **Advanced settings** and **Config settings** menus. It signifies that a related menu is available.

Waveform and Vital Signs Priority

Waveforms and vital signs appear on the screen in order of priority. Where they appear depends on which parameters are active and their respective priority. Parameters are prioritized based on their order of importance for the particular type of patient being monitored. Waveforms appear in the waveform area in the following order, from top to bottom: ECG, SpO₂, and RESP.

NOTES

- In the vital signs field, the HR/Pulse parameter always appears at the top.
- In the waveform field, the ECG lead (if on-line) always appears at the top. Waveforms for other parameters appear if the **View waveform?** option is set to **yes** and space is available in the waveform field.

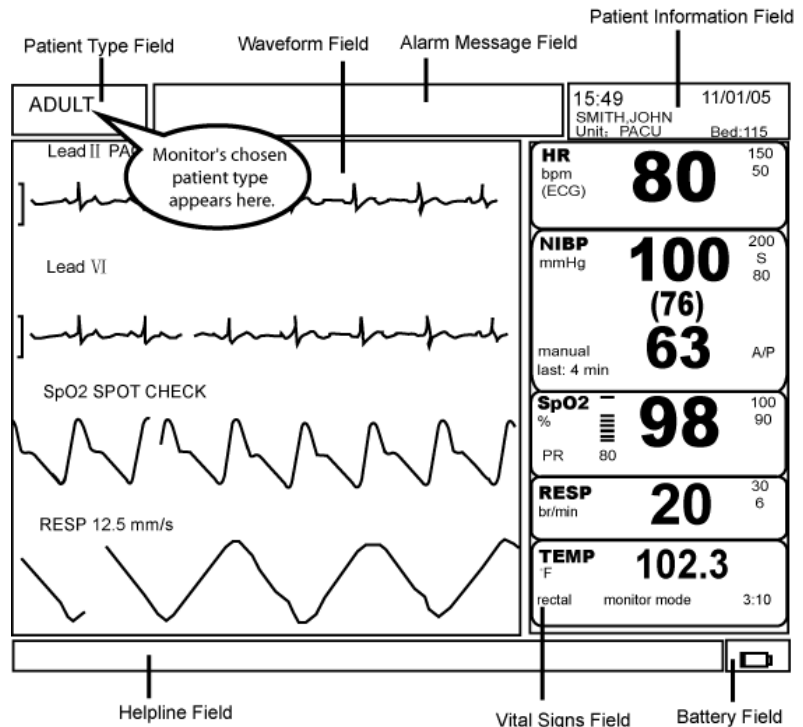
Waveform Sweep Speed

There are three sweep speeds for each cardiac or respiratory waveform. Any change to a cardiac-based sweep speed will affect all cardiac waveforms, unless ECG has the **Fixed ECG sweep speed** option (under **Config setting** menu) is set to **yes**. Respiratory waveforms are affected in the same manner.

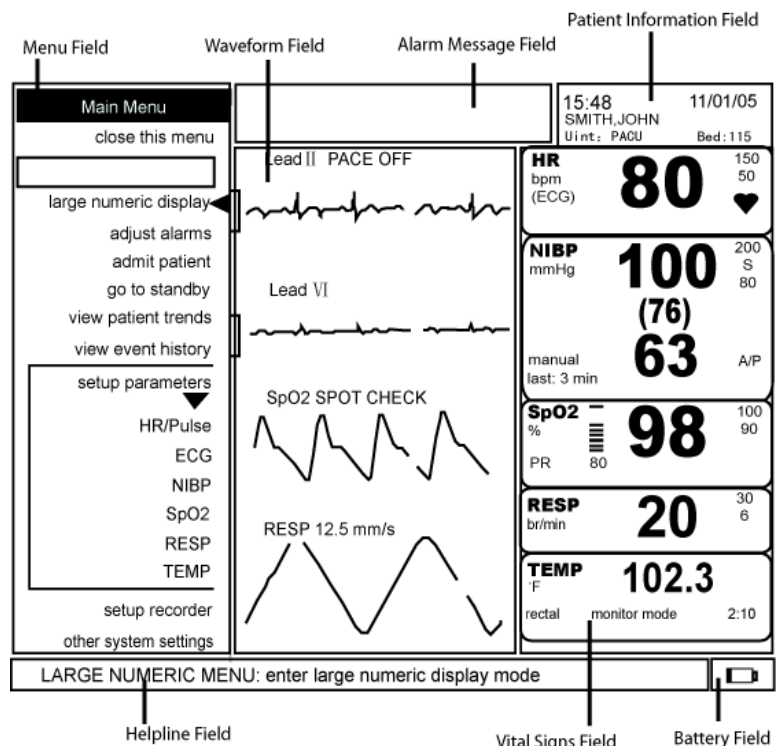
Display Sweep Speed	Time of Displayed Waveform*
50 mm/s	2.7 seconds
25 mm/s	5.4 seconds
12.5 mm/s	10.8 seconds
6.25 mm/s	21.6 seconds

* Only applies to screens without a menu.

Parameter	Sweep Speeds (mm/s)	Waveform Type	Factory Defaults (mm/s)
ECG	12.5, 25, 50	cardiac	adult/ped: 25 neonate: 25
RESP	6.25, 12.5, 25	respiratory	adult/ped: 12.5 neonate: 6.25
SpO ₂	12.5, 25, 50	cardiac	adult/ped: 25 neonate: 25



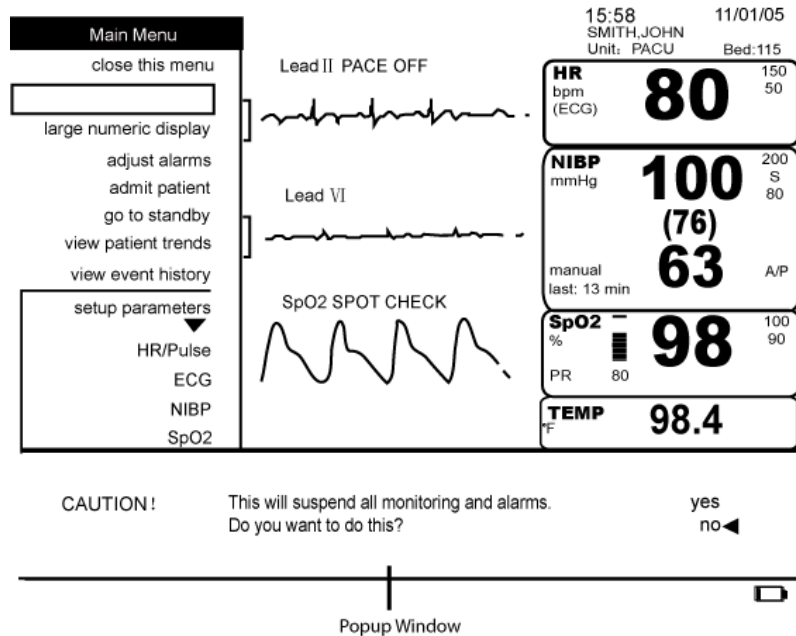
Main Screen



Menu Screen

Popup window

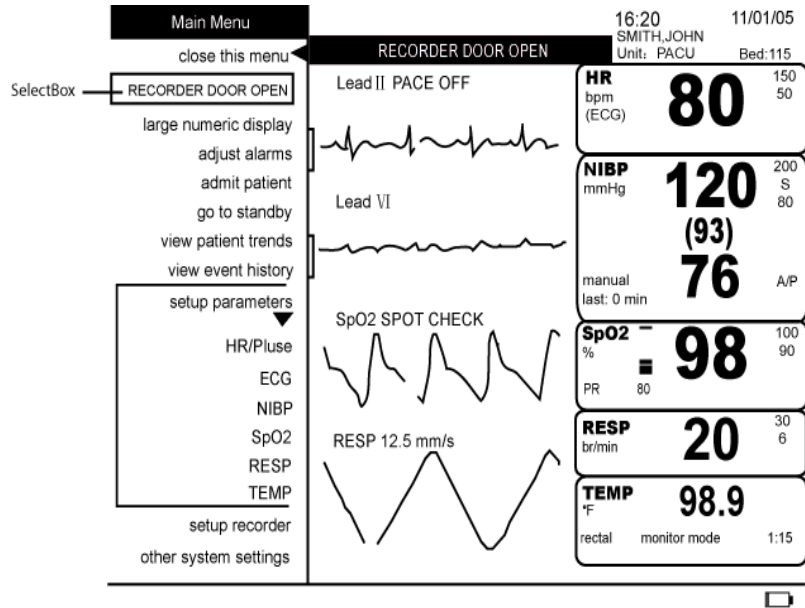
The popup window provides information when a situation requires acknowledgment by the user. In most cases, the popup window remains on the screen until the Trim Knob is pushed. Menu options will not be accessible until the messages within the popup window are acknowledged. In the example below, the popup window appears if you go to standby using the **go to standby** menu option. To close this popup window, choose **yes** or **no**.



Screen with Popup Window

SelectBox

The *SelectBox* is a rectangle that appears as the second item on every menu. When it is inactive, the *SelectBox* is blank and the pointer in the menu skips over it. When the *SelectBox* is active, however, a message blinks inside it and you can choose it. The *SelectBox* can be activated as a result of a patient alarm, a system problem, or an action you take (e.g., opening the Recorder/Printer door to replace the paper roll).

Screen with Active *SelectBox*

The following table provides examples of conditions that cause messages to flash in the *SelectBox*.

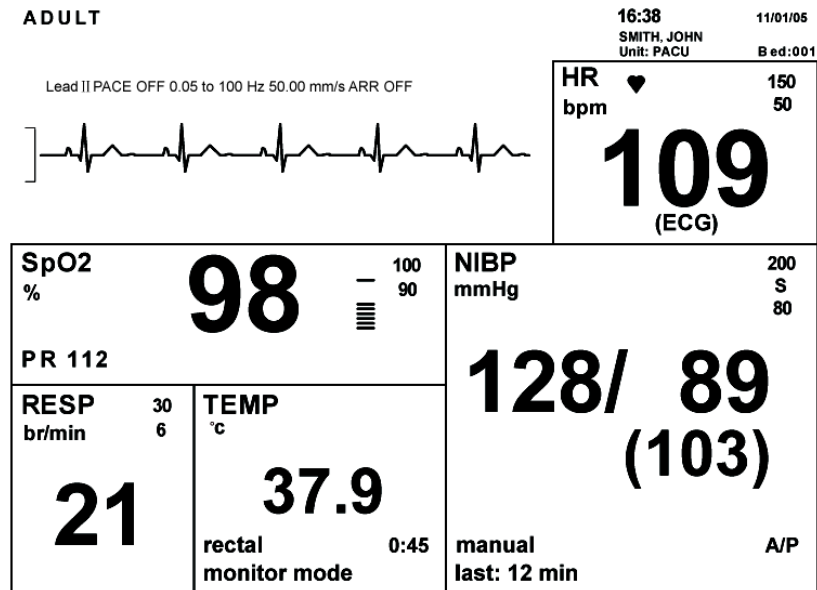
Cause of Message in <i>SelectBox</i>	Acknowledgment of Message	Resulting Action
Freeze hardkey is pushed	choose <i>SelectBox</i>	View frozen waveforms menu appears
System problem is detected	correct problem or choose <i>SelectBox</i>	message in <i>SelectBox</i> is cleared and the alarm is canceled
NIBP cannot determine values	choose <i>SelectBox</i>	message in <i>SelectBox</i> is cleared and the alarm is canceled

Helplines

Helplines appear at the bottom of the screen and continually offer information relevant to the current menu option or task. For example, if the pointer is next to the **turn parameter off** option in the a parameter's setup menu, the helpline will read **Hint: push Trim Knob to suspend all monitoring/alarms for this parameter.**

Large Numeric Display

Select the **large numeric display** option in the **Main Menu**. The **large numeric display** option is available only when the *SelectBox* is not activated.



NOTES

- When any action causes an entry to be placed in the *SelectBox*, the large numeric display disappears from the screen.
- When any hardkey is pressed except **Silence Alarm**, **Print** and **NIBP Go/Stop** hardkeys, the large numeric display disappears from the screen.
- When the Trim Knob is pressed or rotated, the large numeric display disappears from the screen, and the **Main Menu** appears.
- When the **Trend** hardkey is configured for Mini Trends and the large numeric display is active, if the **Trend** hardkey is pushed, the large numeric display disappears and the main monitoring screen with Mini trends on becomes viewable.

Hardkeys

Each of the push-button hardkeys activates specific functions. Hardkeys that have double functions are activated by either a quick-push or a push-and-hold. A quick-push means that the hardkey must be pressed for *less* than 1 second. A push-and-hold means that the hardkey must be pressed for *more* than 1 second. A confirmation tone sounds when the hardkey becomes active.

NIBP Go/Stop Hardkey



The **NIBP Go/Stop** hardkey initiates a noninvasive blood pressure determination. If the NIBP determination is in progress, pressing the hardkey again cancels the determination. If the **NIBP Go/Stop** hardkey is pressed while in an auto mode determination, only the determination in progress is canceled; NIBP remains in auto mode. If the **NIBP Go/Stop** hardkey is pressed while in stat mode, any determination in progress as well as stat mode is canceled.

NOTE: The **NIBP Go/Stop** hardkey is unavailable if an **OVERPRESSURE** alarm is active.

How to start or stop an NIBP determination

1. Choose appropriate cuff size.
2. Squeeze all air from the cuff.
3. Place the appropriate cuff snugly on the patient.
4. Push the **NIBP Go/Stop** hardkey. The cuff pressure appears in the NIBP field of the screen, and the **manual** label appears on the screen above the time since the last determination.
5. To stop an NIBP determination at any time, push the **NIBP Go/Stop** hardkey during the determination.

NIBP Auto Hardkey



The **NIBP Auto** hardkey initiates auto and stat determinations and opens the **Auto BP** menu option for quick access to set the auto cycle time. You can also access **custom** auto BP mode in this menu, letting you meet the needs of your clinical situation.

The time between auto-BP determinations is user-selected (1-, 2-, 3-, 4-, 5-, 10-, 15-, 20-, 30-, 60-, 90-, and 120-minute intervals).

NOTES

- The **NIBP Auto** hardkey is unavailable if an **OVERPRESSURE** alarm is active. The quick-push function of this hardkey is unavailable if: 1) the freeze feature is active or 2) an adjuster menu is open.
- During a **stat** determination, the Monitor sounds a tone and displays the early systolic pressure. The early systolic value will disappear once the blood pressure determination is complete. Early systolic is not shown for the first stat determination.
- If the unit is on battery operation and battery life is at or below 10%, **stat** determinations will not be enabled. However, current **stat** determinations will be completed if underway at the time of the **BATTERY LOW** alarm.

How to start auto-BP determinations

1. Choose appropriate cuff size.
2. Squeeze all air from the cuff.
3. Place the appropriate cuff snugly on the patient.
4. Quick-push the **NIBP Auto** hardkey, a pop up window appears with the message, **CAUTION! Cannot detect cuff type automatically! Please choose cuff type**. Selections are **Adult/Pediatric** and **Neonate**.
5. Set the **Auto BP** menu option to the **manual** label. The **Auto BP** menu option choice with the selected time interval appears. The cuff pressure appears in the NIBP field of the screen, and the **auto: xx min** label appears on the screen above the time since the last determination. After each determination, the cuff deflates to allow for venous return.
6. To cancel a determination, push the **NIBP Go/Stop** hardkey during the determination. The Monitor remains in auto-BP mode unless returned to the **manual** setting under the **Auto BP** menu option.

How to start stat determinations

1. Choose appropriate cuff size.
2. Squeeze all air from the cuff.
3. Place the appropriate cuff snugly on the patient.
4. Push-and-hold the **NIBP Auto** hardkey. The cuff pressure appears in the NIBP field of the screen, and **stat** appears on the screen above the time since the last determination. After each determination, the cuff deflates to allow for venous return.
5. After 5 minutes, NIBP returns to the previous operating mode.
6. To cancel a determination and exit stat mode, push the **NIBP Go/Stop** hardkey during the determination.

How to quickly change the auto-BP time interval

1. Quick-push the **NIBP Auto** hardkey. The **Auto BP** menu option opens and a box appears around the current selection.
2. Turn the Trim Knob to desired time interval and push to confirm selection.

How to setup custom steps

1. With the **setup custom series** option, you can configure up to four separate steps of auto BP determinations by setting the BP time interval and how many times this interval is repeated for each step. The BP time interval can be set to **OFF** or to cycle at intervals of **1 min** to **120 min**. Repeat can be set to **OFF**, **cont** (which continues, or repeats, this step indefinitely) or from **1** to **25** times.
2. After configuring your custom steps, choose **start custom** to begin your custom auto BP mode determinations. The **Custom** label now appears next to the **Auto BP** option and an elliptic circle appears in the NIBP vitals signs area indicating custom auto BP mode. If you switch NIBP modes and then wish to return to your custom auto BP mode, choose **custom** from the **Auto**

BP menu option . Once chosen, the **start custom** menu option changes to the **stop custom** option. To cancel the custom mode, choose **stop custom** from the **setup custom steps** menu. To stop a single custom determination, push the **NIBP Go/Stop** hardkey. As the Monitor completes each step, the number before the elliptic circle will increase by one automatically (in the NIBP vital signs area), and the completed step turns green and becomes unselectable (in the menu options).

Zero Hardkey



This hardkey zeros the IBP determination. It is available for use only when IBP is configured. The IBP parameter is not configured in the Dash 2500 Patient Monitor.

Silence Alarm Hardkey



Once an alarm has been silenced and as long as no new crisis alarms occur, the allotted silence time (**1** or **2** minutes, user-selectable under the **Config settings** menu) must expire before the alarm will sound again. Any new crisis alarm violation overrides the alarm silence function. You may reactivate the alarms at any time during the silence period by pushing the **Silence Alarm** hardkey again.

Crisis Alarms

- If you correct the problem without pressing the **Silence Alarm** hardkey, the alarm will continue. You must always acknowledge a crisis alarm by pressing the **Silence Alarm** hardkey.
- If the Monitor is connected to a remote alarm and a crisis alarm occurs, you must push the **Silence Alarm** hardkey to acknowledge the alarm.

How to silence patient alarms and procedural alarms

1. Push the **Silence Alarm** hardkey.
2. For instructions on responding to the alarm, refer to the **Alarms** section.

NOTE: Alarms remain silenced for a predetermined period of time. Any new crisis alarm violation overrides the alarm silence function.

Power Hardkey



The **Power** hardkey turns the Monitor on and off.

Print Hardkey



The **Print** hardkey initiates recordings at the recorder/printer. You can use the **Print** hardkey to print to a central station if the **record key printout** in the **setup recorder menu** option is set to print **at CS** or if the recorder/printer is *not* connected to the Dash 2500 Patient Monitor. The recorder/printer provides thermal paper recordings of patient information such as waveforms and vital signs. Refer to the **Recorder/Printer** section of this manual for instructions on setting up the recorder/printer.

How to record a timed printout of patient waveforms

1. Ensure that paper is properly loaded into the recorder/printer.
2. Quick-push the **Print** hardkey to start recording a timed printout of chosen waveforms on the screen.
3. Quick-push the **Print** hardkey to stop recording chosen waveforms.

How to record a continuous printout of patient waveforms

1. Ensure that paper is properly loaded into the recorder/printer.
2. Push-and-hold the **Print** hardkey to start a continuous recording of chosen waveforms on the screen.
3. Quick-push the **Print** hardkey to stop recording chosen waveforms.

NOTE: If the Monitor is in alarm mode, push-and-holding the **Print** hardkey terminates alarm mode and starts a continuous recording. No interruption of waveform recording occurs. If the Monitor is in timed mode, push-and-holding the **Print** hardkey terminates timed mode and starts a continuous recording. Interruption of waveform recording occurs because different waveforms can be selected.

Freeze Hardkey



The **Freeze** hardkey captures up to 16.8 seconds of previous and future waveform data (separated by a caret) for all displayed waveforms. This data is captured and displayed at the same rate as the real-time waveform displayed in the waveform field. The following table lists all available waveform display sweep speeds and the number of seconds captured when the **Freeze** hardkey is pressed.

Sweep Speed	Total (Seconds)	Previous/Future (Seconds)
50.0 mm/s	4.2	2.1
25.0 mm/s	8.4	4.2
12.5 mm/s	16.8	8.4
6.25 mm/s	16.8	8.4

When you push the **Freeze** hardkey and a waveform is available, a frozen waveform appears in a popup window. The caret displayed in the popup window along side the waveform indicates the point in time in which the hardkey was pressed.

During a freeze when an ECG waveform is available, an event is stored in the **Patient Event History** window. You can view the frozen ECG waveform at a later time through the **view event history** option in the **Main Menu**. Intervals of time are marked on all freeze recordings and appear as a dash at the top and bottom of the recorder strip. These time markers are printed every 3 seconds. If the ECG waveform is viewable when a limit or crisis alarm occurs (originating from either the ECG or HR/Pulse parameter), a freeze of this waveform is initiated and stored as part of its associated alarm event. To view this waveform and alarm information, choose the **View event history** option in the **Main Menu**. If an alarm occurs when a freeze is on the screen, the Monitor collects and stores the alarm data in event history.

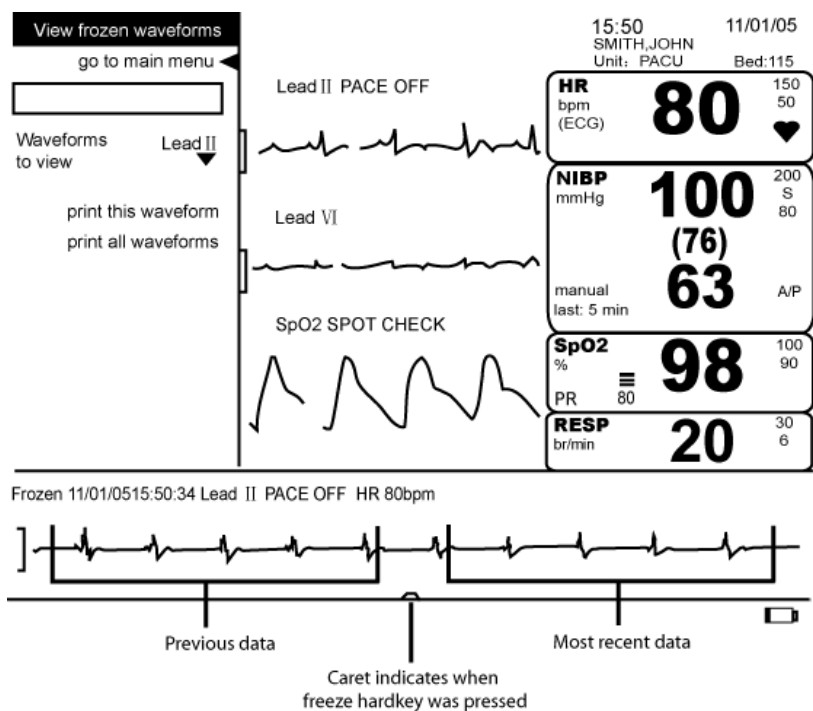
NOTE: The **Freeze** hardkey is unavailable if no waveforms are available to freeze.

How to freeze a waveform

1. Push the **Freeze** hardkey to capture a waveform on the screen. A waveform appears in a popup window at the bottom of the screen and the **View frozen waveforms** menu appears.

NOTES

- ◆ If an adjuster menu item is open, you must first close that option, and then choose the **View frozen waveforms** selection that appears in the *SelectBox*.
 - ◆ The **View frozen waveforms** menu is accessed only by pressing the **Freeze** hardkey.
2. Choose the desired menu options.
 - a. Choose the **Waveforms to view** option for a list of all active parameters capable of displaying a waveform.
 - b. Choose the **print this waveform** option to print a frozen waveform from the Recorder. (Available when the printer is not busy.)
 - c. Choose the **print all waveforms** option to print all frozen waveforms listed in the **Waveforms to View** option. (Available when the printer is not busy.)
 3. To exit, choose **go to main menu** or push the **Freeze** hardkey.



View Frozen Waveforms Message

Trend Hardkey



This hardkey can be configured in two ways: 1) to view mini trends or 2) to view full trends. (The **Trend** hardkey must be configured in password-protected configuration mode.) The trended information appears in either graphic or numeric mode, whichever is the default setting. The **Trend** hardkey—if configured to full trends—opens the view patient trend screen. Pushing the hardkey again closes the trends screen. If the **Trend** hardkey is configured to mini trends, pushing it opens the mini trends screen. Pushing the hardkey again closes mini trends.

NOTE: The **Trend** hardkey (when configured to full trends) is unavailable if:

- ◆ the freeze feature is active or
- ◆ an adjuster-type menu item is open.

Standby Hardkey

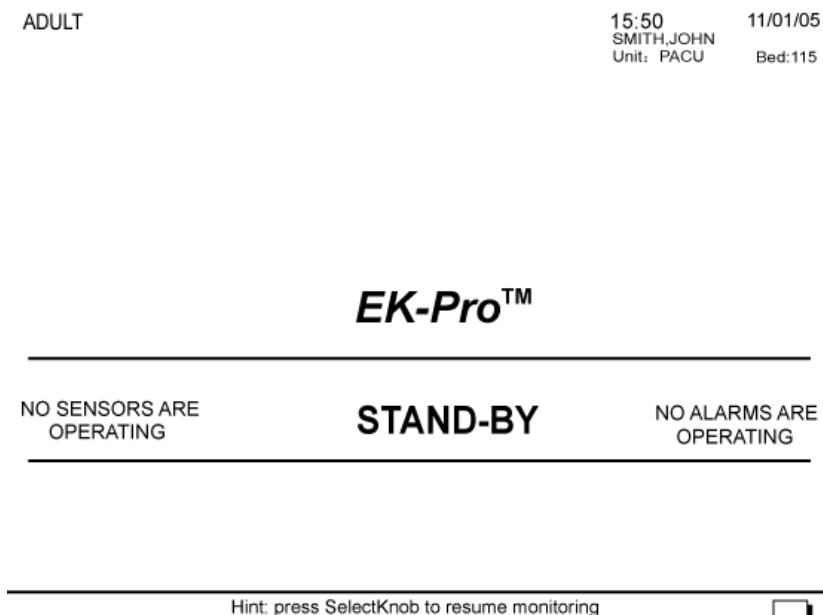


The **Standby** hardkey enters the Monitor into the standby mode. When you put the Monitor on standby, you temporarily suspend all patient monitoring and alarm detection. To exit standby, you must push the Trim Knob or the **Standby** hardkey, which automatically initiates patient monitoring and alarm detection. When exiting standby, alarm limits and other parameter settings do not change unless you choose to admit a new patient. If you perform an admit, the Monitor immediately resets all settings and limits according to the default table found in

the **admit patient** menu. All parameters are turned off-line and are ready when the appropriate patient connections are made. New patient values are separated from the previous patient in the trends information.

NOTES

- The **Standby** hardkey is unavailable if: 1) the *SelectBox* is active, 2) the freeze feature is active, 3) an adjuster menu is open, or 4) a popup window is open.
- If **Freeze** is active, the Monitor will not enter into standby mode.
- Standby is available on battery power. The message **SYSTEM ON BATTERY, AC POWER RECOMMENDED** appears.



Screen in Standby

How to enter Standby

1. Push the **Standby** hardkey. The Monitor goes directly to standby mode.
2. To exit standby and resume patient monitoring, push the **Standby** hardkey or push the Trim Knob. Settings and data prior to standby are retained.

NOTE: After you push the **Standby** hardkey or the Trim Knob, alarms are temporarily disabled and the message **CAUTION! Alarms are temporarily disabled while patient connections are re-established. Is this a new patient you would like to admit?** appears. If this is not a new patient, choose **no**. The Monitor automatically defaults to **no** if you do not respond within 30 seconds, and the popup window disappears.

OR

1. Choose the **go to standby** option from the **Main Menu**. A popup window with the following message appears at the bottom of the screen: **This will suspend all monitoring and alarms. Do you want to do this?**
2. Choose **yes** to switch the Monitor to standby.
3. To exit standby and resume patient monitoring, push the **Standby** hardkey or push the Trim Knob. Settings and data prior to standby are retained.

NOTE: After you push the **Standby** hardkey or the Trim Knob, alarms are temporarily disabled and the message **CAUTION! Alarms are temporarily disabled while patient connections are re-established. Is this a new patient you would like to admit?** appears. If this is not a new patient, choose **no**. The Monitor automatically defaults to **no** if you do not respond within 30 seconds, and the popup window disappears.

Main Hardkey

The **Main** hardkey closes the menu system and takes you to the Main screen.

NOTE: The **Main** hardkey is unavailable if: 1) the *SelectBox* is active, 2) the freeze feature is active, or 3) an adjuster menu is open.

Demo Mode

The Monitor displays all the vital signs values and waveforms under Demo Mode. It is designed for training of operation before use.

Procedures

1. Push and hold the **Silence Alarm** and **Main** hardkeys, then push the **Power** hardkey, hold the **Silence Alarm** and **Main** hardkeys until the Monitor displays the entering screen. The start-up screen shows the **DEMO MODE** message in red in addition to the standard displays. The Monitor enters demo mode operation.
2. The entering screen disappears; the Monitor turns to the main screen. The Monitor displays the **DEMO MODE** message on the upper middle section of the screen. It indicates that the Monitor is under demo mode operation.
3. A pop up window appears with the message, **CAUTION! Cannot detect cuff type automatically! Please choose cuff type**. Selections are **Adult/Pediatric** and **Neonate**.
4. The Monitor displays all the vital signs values and waveforms. All these values and waveforms are not changeable under Demo Mode.
5. Push the **Power** hardkey to power off the Monitor and exit the Demo Mode.

WARNINGS

All the values and waveforms the Monitor displays are fictional

Demo Mode is only designed for the use of training. It is not intended for the use of any other purpose.

No parameters, accessories, central station or any other peripheral equipment are allowed to be connected with the Monitor while in Demo Mode. It is not intended for clinical use or patient monitoring and diagnosis.

NOTES

- No alarms are generated under Demo Mode.
- The Trim Knob and all the menus—with the exception of **go to standby** and **enter patient name** options—are available under Demo Mode. All the hardkeys—with the exception of **Power** hardkey—are not available.
- All settings under menus can be changed under Demo Mode. These changes are saved after exiting Demo Mode. You should set all the changed settings to default before normal use. This can be done under Config Mode. Go to the **Config Settings** menu, and select **reset ALL to factory**. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

LED Displays

Battery in Use

An amber LED indicator on the front of the Dash 2500 Patient Monitor illuminates when the unit is operating from battery power.

AC Operation

A green LED indicator on the front of the Monitor illuminates when the unit is operating from external AC power.

Loss of AC Power

When a usable battery is properly installed, if the Monitor loses AC power, it automatically switches to battery power without interruption of operation.

The following occurs:

- If the **Always display battery icon** option is set to **no**, the battery icon appears. If the option is set to **yes**, an arrow appears beside the battery icon.
- A single tone sounds to notify you of the power switching from AC to battery

- power.
- LED indicators: Battery In Use - ON
AC power - OFF

Other System Settings

This option lets you access more system settings and is found in the **Main Menu**.

turn off system

This option lets you turn the Monitor off.

go to config mode

This option lets you enter into the configuration mode. You must have a password to enter it.

go to service mode

This option lets you enter into the service mode. You must have a password to enter it.

print to CS

This option lets you print a timed central station recording.

Always display battery icon?

This option lets you choose to display the battery icon all the time, even while the Monitor is operating on AC power. Choose **yes** for the battery icon always to appear on the display screen or **no** for the battery icon to appear only when the Monitor is operating on battery power.

Adjust date & time

This option lets you choose a new date and time by manually adjusting the month, day, year, hour, minute, and second.

How to adjust date and time

1. Choose the **Adjust date & time** option from the **other system settings** menu.
2. Use the Trim Knob to choose the new **month, day, year, hour, minute, and second**. Push the Trim Knob to confirm the new setting.

3. Select and push the **set new time & date** option. The message, **CAUTION! This will delete all trends, and stored waveforms. Are you sure you want to do this?** appears in a popup window. Choose **yes** or **no**.

NOTE: If an invalid date or time is entered, the message, **Invalid date/time entered. Not updated.** appears in a popup window. Choose **OK**.

Advanced settings

Select color format

This option lets you choose the color format for the Monitor's display screen. Choose **mono**, **limited color**, or **full color**. Refer to "Display Screen" subhead in this section for further instructions.

Adjust keyclick volume

This option lets you adjust the volume of the Monitor's keyclick. Choose from **1** to **5** (loudest).

Adjust system volume

This option lets you adjust the volume of the overall system. Choose from **1** to **10** (loudest).

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Config HostComm

This option allows you to view, but not change, the various HostComm configuration options. To change any configuration options, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Turn the Dash 2500 Monitor off

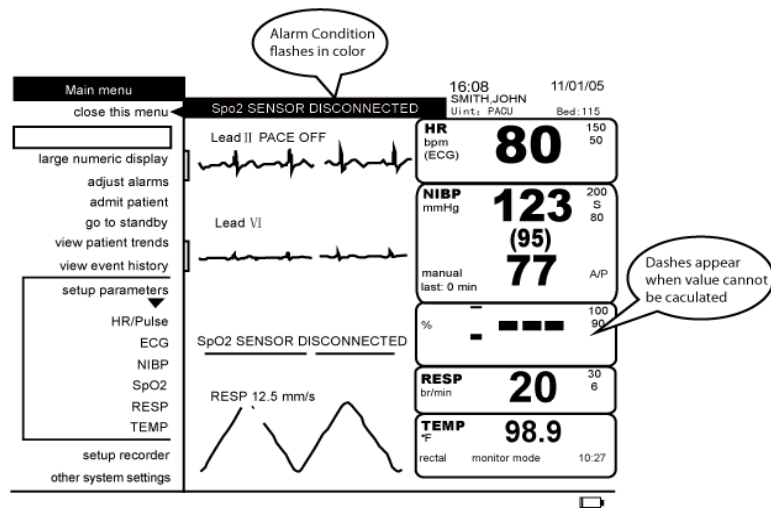
How to turn the Dash 2500 Monitor off

1. Push and briefly hold the **Power** button on the front of the Monitor **once**.
OR
1. Choose **other system settings** from the **Main Menu**.
2. Choose **turn off system**. The message **CAUTION! This will turn the system off. Are you sure you want to do this?** appears in a popup window. When you choose **yes, the Monitor** automatically turns off.

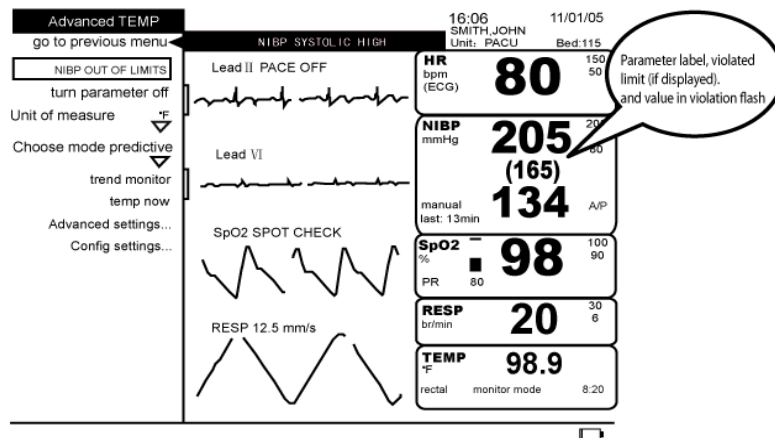
4 Alarms

Alarms:

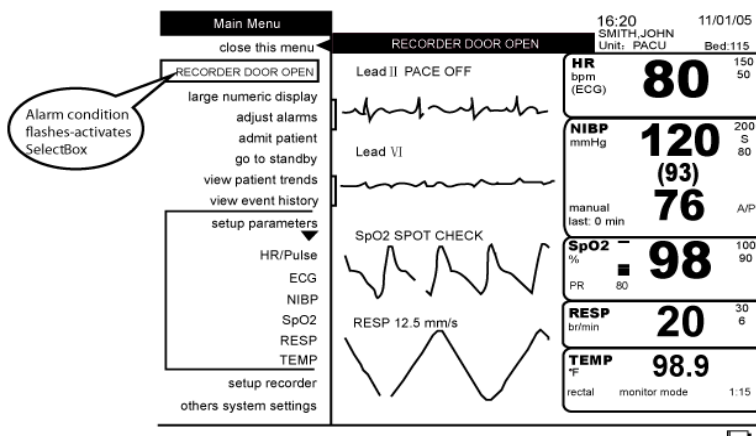
Status Waveform Alarms



Limit Alarms



System Alarm



Description

The Monitor provides visible and audible indications of patient- and system-related alarm conditions. An alarm can generate an audible indication, a message on the screen, a printed document, and is recorded in the view event memory. All active alarm messages appear in the alarm message field. In addition, alarm indicators can appear in the vital signs field, the waveform field, and/or the *SelectBox*. All active alarm indicators appear in color.

Location	Indication of Alarm
Vital Signs Field	Parameter label, violated limit (if set to display), and value in violation flash. Example: RESP 30 (limit) 35 (value)
Alarm Message Field	Up to two lines of text Example (top line): ALARM SILENCE 0:51 Example (second line): RESP HIGH
Waveform Field	Single line of text above waveform area of parameter in violation Example: RESP BASELINE SATURATION
<i>SelectBox</i>	Single line of text in <i>SelectBox</i> Example: RECORDER DOOR OPEN

Using the **adjust alarms** menu option, you can set alarm limits and volume for all active parameters. In addition, each **setup parameter** menu (except ECG and TEMP) has an **adjust limits** option that lets you set the alarm limits for that parameter. The alarm limit values and alarm volume can be left at the default settings or be adjusted manually. The alarm limit values can be adjusted automatically around the patient's current condition.

NOTE: The default settings are for convenience only and are not intended for all clinical situations. Users should establish appropriate alarm limits.

WARNINGS

An Asystole on power up does not cause an alarm.

Filter of artifact RESP signals can cause a delay in alarms.

Buffer of SpO₂ saturation and pulse rate values from SpO₂ can cause a delay in alarms.

The operator should check that the current default settings of alarms is appropriate prior to use on each patient.

A potential hazard can exist if different default alarm settings are used for the same or similar equipment in any single area, e.g., an intensive care unit or cardiac operating theater.

Interruption of Visible and/or Audible Indications

The visible or audible indications of alarms can be interrupted when one of the following features is activated: alarm disable, alarm volume off, or alarm silence.

- **Alarm disable** - When you turn on the Monitor, go into standby mode, or return from standby mode, alarms are temporarily disabled until patient connections are reestablished. The message **ALARM DISABLE X:XX** appears in the alarm message field until alarms are restored. The visible and audible indications are interrupted while this feature is activated. The following alarms cannot be disabled: **MEMORY LOST, XXX PARAMETER FAILED, XXX PARAMETER ERROR, BATTERY LOW, and NIBP OVERPRESSURE**. To resume monitoring, choose the *SelectBox* and push the **Silence Alarm** hardkey.

NOTEXXX denotes the parameter name or label.

- **Alarm volume** - If the alarm volume is set to **0**, alarms are indefinitely silenced, including crisis alarms. The message **ALARM VOLUME OFF** appears in the alarm message field. Alarms will not be audible again until the volume is adjusted above **0** (see **Adjust Alarms** menu).

NOTES

- ◆ **Alarm volume** can only be set to **0** if this option has been chosen in the Configuration mode.
- ◆ Alarm volume applies to all alarms except system fault alarms.
- ◆ Alarm volume can be adjusted from 45dB to 60dB.
- ◆ **Alarm silence** - Any time the **Silence Alarm** hardkey is pushed, the audible indications for any existing alarms are temporarily silenced. The length of the alarm silence (**1** or **2** minutes; user selectable under **Config settings** menu) is set in the Configuration mode.

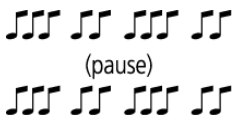
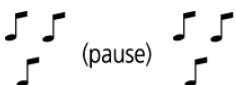
Alarm Priorities

Most alarms have four priority levels—crisis, warning, procedural, and message—which can be changed to meet the needs of a particular department, patient, or clinician. You can modify the alarm priorities in the **Advanced Settings** menu of the appropriate parameter. Crisis, warning, and procedural alarms have audible tones that differentiate them from each other. Message alarms have no audible indications.

NOTES

- The asystole and VFIB/VTACH alarms are set permanently at crisis priority.
- Artifact alarm will escalate from message to procedural after 20 seconds.

Alarms: Alarm Priorities

Alarm Priority	Audible Indications	Record on Alarm?	Visual Indication Color	Visual Indication Flashing Rate
Crisis		yes, if option chosen	red	0.5 Hz
Warning		yes, if option chosen	red	0.5 Hz
Procedural		no	red	0.5 Hz
Message	none	no	yellow	constant on
OFF	none	none	none	none

Default Alarm Priorities				
Parameters	Crisis	Warning	Procedural	Message
Heart Rate/ Pulse		Limit alarms priority		
ECG	VTACH		Lead fail, Replace electrodes	Artifact
NIBP		Limit alarms priority	No determination, Over-pressure, Pump timeout, Total timeout, Level timeout.	
SpO ₂		Limit alarms priority	Lost pulse, Sensor disconnected, Sensor faulty, Sensor off	
RESP	Resp approaching	Limit alarms priority	Lead fail, Saturation, Artifact	
TEMP			Bad Probe, Too Hot, Disconnected	

Crisis

A crisis alarm must be acknowledged by pushing the **Silence Alarm** hardkey even if the alarming condition has been corrected.

what if...	result
multiple crisis conditions occur at the same time	alarm messages appear sequentially in alarm message field; pushing Silence Alarm hardkey once acknowledges all alarms
alarms have been silenced and a new crisis alarm occurs	new crisis alarm overrides silence; push Silence Alarm hardkey to acknowledge
monitor is connected to remote alarm	alarm cannot be acknowledged from remote location; push Silence Alarm hardkey to acknowledge

Warning

A warning alarm continues until the alarming condition has been corrected. Pushing the **Silence Alarm** hardkey will temporarily suspend the audible indication.

what if...	result
alarms have been silenced and a new warning alarm occurs	new warning alarm DOES NOT override silence; indication of new alarm will NOT be audible until silence time period has ended

Procedural

A procedural alarm continues until the alarming condition has been corrected. Pushing the **Silence Alarm** hardkey will temporarily suspend the audible indication.

what if...	result
alarms have been silenced and a new procedural alarm occurs	new procedural alarm DOES NOT override alarm silence; indication of new alarm will NOT be audible until silence time period has ended

Message

A message alarm has no audible indication. The visual indication will continue until the alarming condition has been corrected.

Responding to Alarms

If the accuracy of any value is questioned, first check the patient, then the Monitor. When using a remote alarm, the Dash 2500 should be considered the primary alarm source; all alarms must be silenced at the Monitor, not through the central station.

NOTE: Always check the **Silence Alarm** hardkey and alarm message field to ensure all alarms are enabled again before leaving the Monitor.

How to respond to an alarm

1. Assess the patient's condition.
2. Push **Silence Alarm** hardkey.
3. Identify cause of the alarm.
4. Correct the alarming condition.

How to respond to a limit alarm

1. Assess the patient's condition.
2. Push **Silence Alarm** hardkey and, if necessary, choose the SelectBox containing the limit alarm message (e.g., **NIBP OUT OF LIMITS**) to acknowledge the alarm.
3. Adjust the alarm limits if necessary (refer to **Adjust Alarms** menu).

Silence Alarm Hardkey



Once an alarm has been silenced and as long as no new crisis alarms occur, the allotted silence time (**1** or **2** minutes, user-selectable under **Config settings** menu) must expire before the alarm will sound again. Any new crisis alarm violation overrides the alarm silence function. You may reactivate the alarms at any time during the silence period by pushing the **Silence Alarm** hardkey again.

Crisis Alarms

- If you correct the problem without pushing the **Silence Alarm** hardkey, the alarm will continue. You must always acknowledge a crisis alarm by pushing the **Silence Alarm** hardkey.
- If the Monitor is connected to a remote alarm and a crisis alarm occurs, you must push the **Silence Alarm** hardkey to acknowledge the alarm.

Alarm Limit Settings

Alarm limit settings are not affected when you turn the Monitor off and then on again unless you choose to admit a new patient. In this case, the alarm limits return to those set in the chosen default. Parameter alarm limits become active when patient values go either above the set high limit or below the low limit (e.g., HR high limit set at 140 bpm. Alarm will become active if HR reaches 141 bpm).

Adjust Alarms Menu

The **Adjust alarms** menu lets you adjust alarm volume and alarm limits for all active parameters, as well as print a recording of the alarm limit settings. After choosing this option, all alarm limits appear in the waveform area of the screen listing the parameters, limits, values, and units.

Limits				
Parameter	lo	Value	hi	Unit
HR/Pulse	50	80	150	bpm
NIBP systolic	80	100	200	mmHg
NIBP diastolic	30	63	120	mmHg
NIBP mean	40	76	140	mmHg
SpO2	90	98	100	%
RESP	6	20	30	br/min

print limits

This menu item lets you print the current alarm limits for all active parameters. This option is available when the printer is not busy.

Adjust alarm volume

This menu option lets you adjust the alarm volume. Alarm volume may be set from **0** to **5** for all alarms (**0** is only available if the chosen set of user defaults was configured this way). Alarm volume applies to all alarms except system faults.

NOTE: If the alarm volume is set to 0, the message **ALARM VOLUME OFF** appears on the screen.

Choose autoset%

This menu option lets you change the percentage used to adjust limits around the patient's current condition. The percentage can be set to **20%**, **30%**, or **40%**. Once a selection is made, all alarm limits for the active parameters are changed, except for SpO₂.

autoset all

When you choose this option, alarm limits are changed according to the last known value for each parameter based on a percentage (see **choose autoset %**).

NOTES

- Auto-set alarm limits are provided in each parameter section.
- The only parameters listed in the **Adjust alarms** menu are those that are currently active.
- You cannot use the **autoset all** option to automatically set alarm limits for SpO₂.

auto-set, hi, lo

These three options allow you to set alarm limits for individual parameters automatically or manually.

NOTE: You cannot use the **auto-set** option to automatically set alarm limits for SpO₂.

How to set individual parameter alarms automatically

1. Choose **Adjust alarms** menu.
2. Choose the desired parameter.
3. Choose auto-set. The chosen parameter's alarm limits are automatically set around the patient's current values. The limits are based on the current readings.

How to set individual parameter alarms manually

1. Choose **Adjust alarms** menu.
2. Choose the desired parameter.
3. To adjust an alarm limit, move the pointer to the appropriate limit and push the Trim Knob. A box appears around the limit.

4. Turn the Trim Knob clockwise to increase the number or counterclockwise to decrease the number.
5. Push the Trim Knob to confirm the new limit.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

View Event History Menu

When viewing the event history, patient-related events are viewed separately from system-related events. You can access the last 200 patient-related events and the last 100 system-related events. A maximum of 16 events can be displayed on the screen at any time and events are arranged with the most recent at the top of the screen.

For every alarm generated, an entry is stored in the **Patient Event History**, **System Event History**, or both histories. Events that are not clearly patient or system related are listed below.

- the admission of a new patient (**Patient Event History**)
- cancellations of NIBP determinations (both **Patient Event History** and **System Event History**)
- a change to the alarm or system volumes (both **Patient Event History** and **System Event History**)
- activation or deactivation of the alarm disable function (**System Event History**)
- parameter errors and failures (**System Event History**)
- the activation of **Freeze** hardkey (**Patient Event History**)
- a change in the date and time (both **Patient Event History** and **System Event History**)

Information included with each event:

- date
- time
- condition causing the event
- patient value that violated its limit, for entries associated with limit alarms
- limit violated, for entries associated with limit alarms
- unit of measure
- priority level of the alarm at the time it was generated

If available, a frozen ECG primary waveform is stored with any of the following stored events:

- crisis alarm generated by the ECG parameter
- crisis alarm generated by the HR/Pulse parameter
- **Freeze** hardkey is pushed

Events with stored waveforms are indicated by an asterisk (*) in the Wave column. A maximum of 12 patient events may be stored with a frozen waveform. If 12 events exist, the next event with a frozen waveform will replace the oldest stored waveform and event. If this older event is still one of the most recent 200 patient events, it continues to appear in the **Patient Event History** window without a stored waveform or an asterisk (*).

Choose event history

This option lets you choose to view either the **Patient Event History** or **System Event History** window.

view older events

This option lets you view previous events. Each time you push the Trim Knob, a new screen of events is displayed.

view newer events

This option lets you access the most recent events, including any events stored while the **Event History** window is open. Each time you push the Trim Knob, a new screen of events is displayed.

print this page

This option lets you print the list of events currently on the screen. It is available when the printer is not busy and the **crisis events and frozen waveforms** option is closed.

print all pages

This option lets you print all events being displayed in the **Event History** window (either Patient Events or System Events). It is available when the printer is not busy and the **crisis events and frozen events** option is closed.

NOTE: If any new events occur while a page of the oldest events is being viewed/printed, then an equal number of the oldest events will be removed from memory and no longer available for printing.

crisis events and frozen waveforms

This extended menu is available only when the **Patient Event History** window is chosen and there is at least one stored event and the freeze feature is not active.

choose event to view

This option lets you choose to display an event's frozen waveform.

print this event

This option lets you print the chosen event's frozen waveform. It is available when the printer is not busy and a stored event has been chosen.

delete this event

This option lets you delete the chosen event.

delete all frozen waveforms

For the events listed, choosing this option deletes the frozen waveforms that are stored for those events. These events will no longer be displayed in the **Events with Frozen Waveforms** window. If this event is still one of the most recent 200 patient events, it will continue to appear in the **Patient Event History** window. An asterisk (*) will no longer appear in its waveform column.

System Fault Alarm

If a system fault occurs, you will hear a constant tone and the screen will be blanked within 5 seconds. The cause of the system fault is stored in the system events as a fault code.

How to respond to a System Fault Alarm

1. If the Monitor is alarming, turn it off.
2. Contact GE Medical Systems Information Technologies Technical Support at 1-800-558-7044 (USA) or contact your local representative.

Default Alarm Limits				
Parameter	Adult/Ped		Neonate	
	Low	High	Low	High
HR/Pulse	50 bpm (adult) 60 bpm (ped)	150 bpm (adult) 160 bpm (ped)	90 bpm	200 bpm
RESP	6 br/min (adult) 10 br/min (ped)	30 br/min (adult) 60 br/min (ped)	15 br/min	100 br/min
NIBP	Systolic: 80 mmHg (adult) Systolic: 70 mmHg (ped)	Systolic: 200 mmHg (adult) Systolic: 150 mmHg (ped)	Systolic: 40 mmHg	Systolic: 100 mmHg
	Diastolic: 30 mmHg (adult) Diastolic: 30 mmHg (ped)	Diastolic: 120 mmHg (adult) Diastolic: 90 mmHg (ped)	Diastolic: 20 mmHg	Diastolic: 60 mmHg
	Mean: 40 mmHg (adult) Mean: 40 mmHg (ped)	Mean: 140 mmHg (adult) Mean: 100 mmHg (ped)	Mean: 30 mmHg	Mean: 70 mmHg
SpO ₂	% Saturation: 90 (adult) % Saturation: 92 (ped)	% Saturation: 100 (adult) % Saturation: 100 (ped)	% Saturation: 88	% Saturation: 100

5 Admit Patient

Admit Patient:

Description

Whenever you turn on the Monitor or return from standby, a popup window appears with the message, **CAUTION! Alarms are temporarily disabled while patient connections are re-established. Is this a new patient you would like to admit?** Select **yes** or **no**. If there is no user interaction within 30 seconds, the Monitor automatically defaults to **no**. However, if you decide to admit a patient, the Monitor immediately resets all settings and limits based upon the preselected configuration and turns all parameters off-line. All parameters are auto-switched on once a patient is admitted and patient connections are made.

If you want to admit a patient during monitoring mode, use the **admit** option. This performs all the same operations as selecting **yes** from the admit popup window, except parameters are not turned off-line.

NOTE: If SpO₂ was previously off-line and a new patient is admitted, the SpO₂ parameter does not auto-switch on.

The following table guides you through the admit/discharge procedures and how they effect the Monitor.

Admit/Discharge Procedures				
Action	Patient Information Field	Entry in History	Reverts to Default Settings?	Entry in Trends
admit (no data in trends)	no change	PATIENT ADMITTED	yes	blank trend moves to Previous Patient, start trending Current Patient, admit/discharge marker marks current time
admit (data in trends), Yes to Popup menu asking if you want to save trends	no change	PATIENT ADMITTED-SAVE	yes	continue trending in Current Patient, admit/discharge marker at last admit/discharge
admit (data in trends), No to Popup menu asking if you want to save trends	no change	PATIENT ADMITTED-DISCARD	yes	current trend data copied to Previous Patient, new data in Current Patient, admit/discharge marker marks current time
discharge	patient's name is replaced with NO PATIENT ADMITTED	PATIENT DISCHARGED	yes	current trend data copied to Previous Patient, new data in Current Patient, admit/discharge marker marks current time
NOTE: If a patient is admitted while an NIBP or TEMP determination is in progress, the determination is canceled. Three different default tables (monitoring configurations) can be set in the password-protected configuration mode. Each default table should contain settings appropriate for a particular patient type (e.g., adult, neonate, etc.). In monitoring mode, you can choose the appropriate table for your patient through the choose patient settings option.				

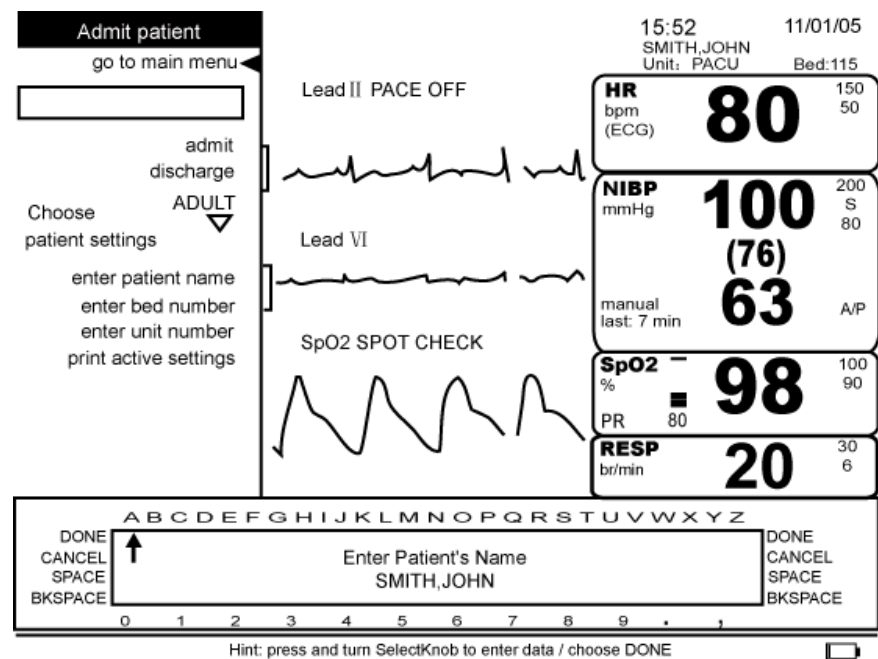
Personal patient information (e.g., patient name, bed number) is entered through the **Admit patient** menu though it is not necessary for an admission or a recording to occur.

When a patient is admitted, the following changes occur:

- In Trends: New patient values are separated from previous patient's values and the previous patient's name is erased.
- In Event History window: Previous patient's waveforms associated events are erased. History log of event is not erased.
- The Monitoring configuration reverts back to default settings.

NOTE: Any time a patient is admitted, the settings return to the chosen set of defaults.

Admit Patient Menu



admit

You can use this option to admit a patient at any time during monitoring. However, for optimal results, a new patient should be admitted prior to, or shortly after monitoring for that patient begins.

NOTES

- Check that the settings are correct for the patient you are admitting. If the patient type is not correct, immediately select the appropriate option from **choose patient settings**.
- You can admit a patient without entering the name, bed number, or unit number.

- If you enter the patient's name, bed number, or unit number before choosing the **admit** option, the data you have entered will be erased.

How to admit a patient

1. Choose **admit patient** from the **Main Menu**.
2. Choose **admit** from the **Admit patient** menu.
3. The message **Admitting new patient, please wait** appears.
4. Choose **patient type** from the **choose patient settings** option.
5. Enter patient name.
6. Enter bed number.
7. Enter unit number.

discharge

You can use this option to discharge a patient at any time during monitoring. Discharging a patient automatically saves the patient data in patient trends as previous patient.

Choose patient settings

This option lets you choose between customized tables based upon a particular patient type. Each table should be configured for a particular patient type (adult, neonate, etc.). There are three patient types: **neonate** (under 29 days old), **pediatric** (between 29 days and 18 years old), and **adult** (over 18 years old). When a new table is chosen, the Monitor immediately reconfigures itself accordingly. If the menu window is closed, the name of the chosen default table appears in the upper left corner of the screen. When the menu window is open, it is not viewable. As part of this process, all parameters are turned off-line and auto-switched on as patient connections are made. Patient data continues to be trended for the current patient and does not erase the current patient's name if it had been previously entered.

enter patient name

This option gives you access to a popup window containing the alphabet, numbers 0 to 9, and punctuation. You can enter up to 20 characters of a patient's name within the physical limit of the available space. The patient's name will appear in the patient information field (upper right corner of the screen) and on strip recordings until a new patient is admitted.

NOTE: Entering the patient's name is not necessary for admission.

How to use popup window

1. Turn the Trim Knob to move the pointer to the desired character. Push the Trim Knob to enter the character.
2. To add spaces, place the pointer next to **SPACE** selection and push the Trim Knob as many times as necessary. To delete characters or spaces, place the pointer next to **BKSPACE** selection and push the Trim Knob as many times as necessary.
3. To confirm your choices, place the pointer next to **DONE** selection and push the Trim Knob.

enter bed number

This option gives you access to a popup window containing the alphabet, numbers 0-9, and punctuation. You can enter up to 4 characters. The patient's bed number will appear in the patient information field (upper right corner of screen) and on printouts.

enter unit number

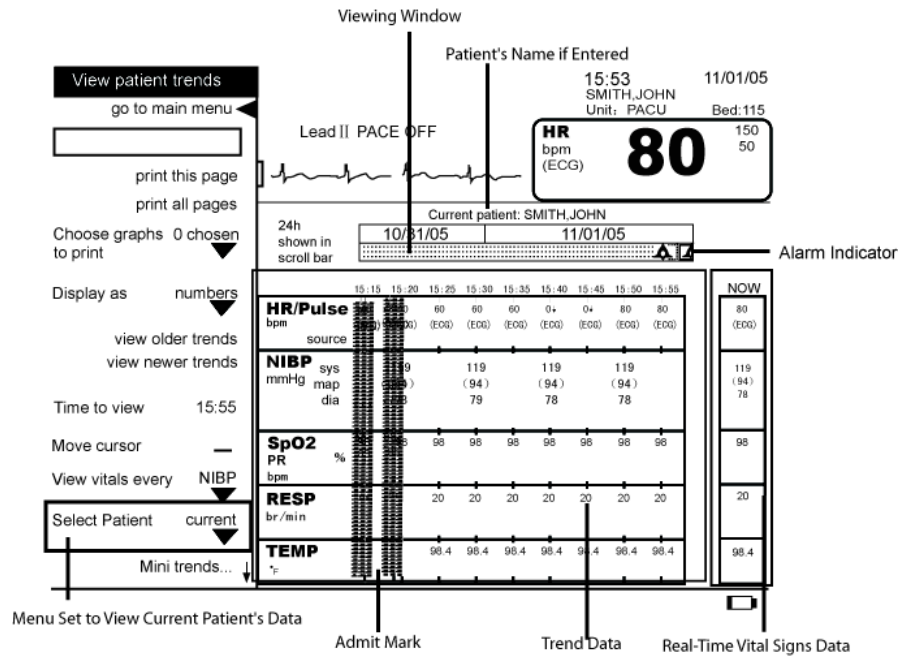
This option gives you access to a popup window containing the alphabet, numbers 0-9, and punctuation. You can enter up to 6 characters. The patient's unit number will appear in the patient information field (upper right corner of screen) and on printouts.

print active settings

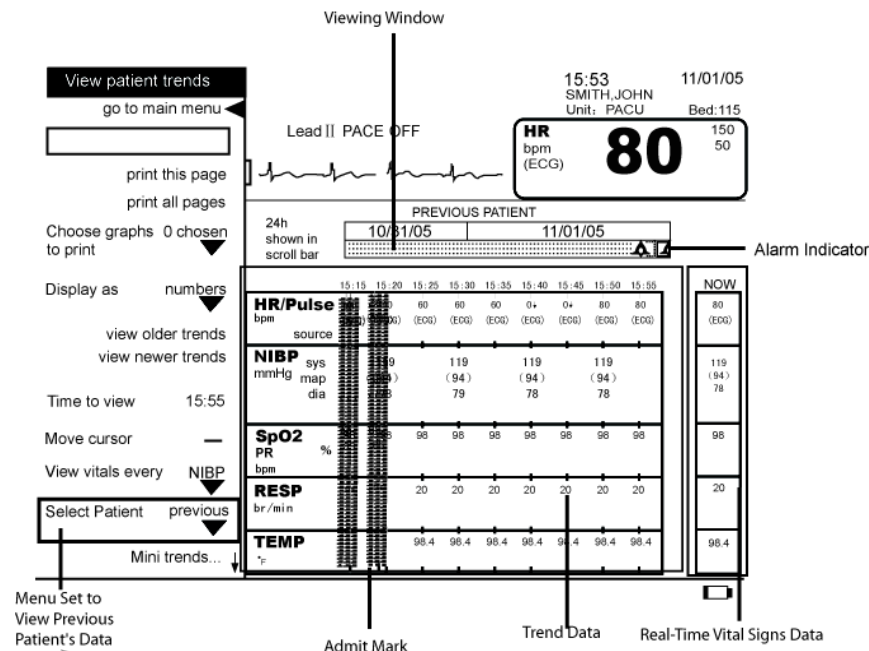
This option lets you print all customized settings for the chosen default table. It is available when the printer is not busy. Once started, a popup window appears with the message, **All active settings are being printed. To cancel, choose OK.** If you choose **OK**, printing will stop. Otherwise, when all settings for the chosen default table have been printed, the popup window disappears.

6 Trends

Trends:



Current Patient Trends Screen



NOTE: Only allowed if save previous data? is set to yes and the previous patient data is available.

Previous Patient Trends Screen

Description

Trends can be viewed in two different forms: up to 24 hours of data for all parameters (full trends) or a limited set of parameters and data that can be viewed on the main screen below the waveform area (mini trends). Trends can be accessed through either the **Trend** hardkey or the **view patient trends** option in the **Main Menu**. The **Trend** hardkey can also be configured in two ways: to view full trends or to view mini trends. This hardkey must be configured in the password-protected configuration mode. The **view patient trends** option in the **Main Menu** accessed full trends, which gives you the capability of viewing and printing vital signs and alarms over the previous 24 hours. The trends screen, which is designed in a spreadsheet format, provides up to 10 data points for each parameter being monitored. Trended information can be displayed in two modes: graphs or numbers. The default mode must be configured in the password-protected configuration mode. Once set, the Monitor always returns to the pre-set default mode. The top waveform and the heart rate, with its source, are always visible above the trends screen.

The CURSOR column is an option that allows you to view the time and values associated with trended graphical data. Once activated, a vertical line—a cursor line—appears in the trended data area. Turn the Trim Knob to move the cursor line across the trended data. As the cursor line touches a plotted point on the graphical trends, the corresponding time and values appear in the CURSOR column. The CURSOR column appears to the left of the NOW column. It is not displayed when the full trends window is initially opened. You can access the CURSOR column by choosing the **view patient trends** option in the **Main Menu** and then choosing the **Move cursor** option. Once the CURSOR column is activated, you can switch between graphs or numbers modes. The CURSOR column remains activated until the trends screen is closed.

The far right-hand column, called the NOW column, contains real-time vital sign data that is updated every second for the current patient. The 9 columns in a group at the left of the NOW column (and the CURSOR column, if activated) display data at selected time intervals. The data are displayed left to right, oldest to newest. The right-hand column in the 9-column group contains data from the time you select in the **Time to view** option.

A menu option allows you to choose intervals at which to display the data. You can also choose a parameter that is not continuously updated (e.g., NIBP) and view up to 10 data points (including the NOW column) along with the other vital signs taken at the same times.

If a patient alarm occurs while a trends screen is visible, an alarm message appears in the alarm message field and the value causing the alarm flashes in the NOW column. An up arrow next to the value signifies a high limit violation and a down arrow signifies a low limit violation. In addition, an alarm bell icon will appear in the scroll bar to provide a visual reference to the time of the alarm.

When a patient is admitted or discharged (if you chose to save the data), two thick vertical bars known as the ADMIT/DISCHARGE MARK appear at the appropriate time column and the patient's name appears above the scroll bar. The admit mark is visible at that place in the time record for 24 hours. Previous patient data can also be viewed in the 9-column group if your monitor has been

configured to do so. Data from the previous patient is displayed with a dot pattern in the background and cannot be viewed at the same time as current patient data. The message **PREVIOUS PATIENT** appears above the scroll bar when viewing previous patient data. Data in the NOW column are always from the current patient.

Trend Hardkey

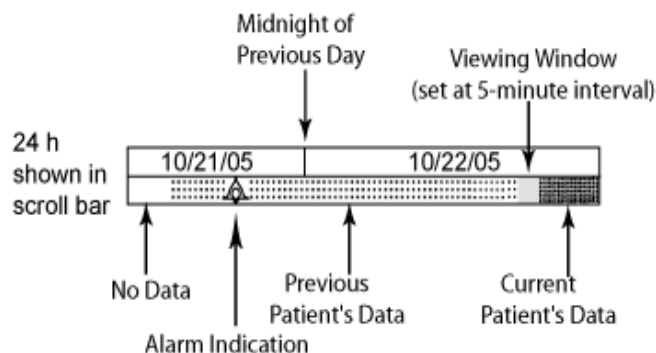


This hardkey can be configured two ways: 1) to view mini trends or 2) to view full trends. (The **Trend** hardkey must be configured in password-protected configuration mode.) The trended information appears in either graphs or numbers mode, whichever the default setting. The **Trend** hardkey—if configured to full trends—opens the view patient trend screen. Pushing the hardkey again closes the trends screen. If the **Trend** hardkey is configured to mini trends, pushing the hardkey opens the mini trends screen at the bottom of the waveform area in the main screen. Pushing the hardkey again closes mini trends.

NOTE: The **Trend** hardkey (when configured to full trends) is unavailable if: 1) the freeze feature is active or 2) an adjuster menu is open.

Scroll Bar

The scroll bar is positioned across the top of the 9 columns in the full trend spreadsheet. It provides you with information about the data obtained in the past 24 hours. If the 24-hour period includes parts of 2 days, a vertical line signifies midnight of the previous day. A dense dot pattern in the scroll bar indicates that data during that time period are from the current patient, and a sparse dot pattern indicates that data are from the previous patient. A lack of dot pattern indicates the time before the previous patient's data. An alarm bell icon in the scroll bar lets you know that at least one data point trended around that time was out of limits.



Viewing Window

Since data are trended every minute over a 24-hour period, only portions of the data can be viewed at one time. A smaller, highlighted bar in the scroll bar, called the Viewing Window, provides an indication of what part of the 24-hour period is being displayed on the screen. The Viewing Window can be helpful when you are using the **Time to view** menu choice. As you scroll through time, the Viewing Window moves and you can position it over the portion of the scroll bar that represents the time you want to view. The most recent trends will always be the portion of time viewed when the full trend window is first opened. The position of the Viewing Window within the scroll bar indicates the relative age of the trends on the screen. If the Viewing Window is positioned toward the right end of the scroll bar, you are viewing more recent data. If the Viewing Window is positioned farther to the left, you are viewing older data. The size of the Viewing Window changes in proportion to the time interval you have chosen in the **View vitals every** menu. The Viewing Window becomes narrower at shorter intervals and wider at longer intervals.

Conventions Used in Trends menu

The following conventions are used in the trends screen:

- Blanks - parameter not being trended at this time
- Up arrow - high limit violation
- Down arrow - low limit violation
- Sparse dot pattern - previous patient data
- Dashes - invalid data

NOTES

- If the **View SpO2 PR?** option in the **advanced SpO2 menu** is set to **yes** and the source of the HR/Pulse is SpO₂, a trended value appears for SpO₂ and dashes for PR.
- If the **View SpO2 PR?** option in the **advanced SpO2 menu** is set to **yes** and the source of the HR/Pulse is not SpO₂, a trended value appears for both SpO₂ and PR.
- If the **View SpO2 PR?** option in the **advanced SpO2 menu** is set to **no**, a trended value appears for SpO₂ and blank appears for PR.

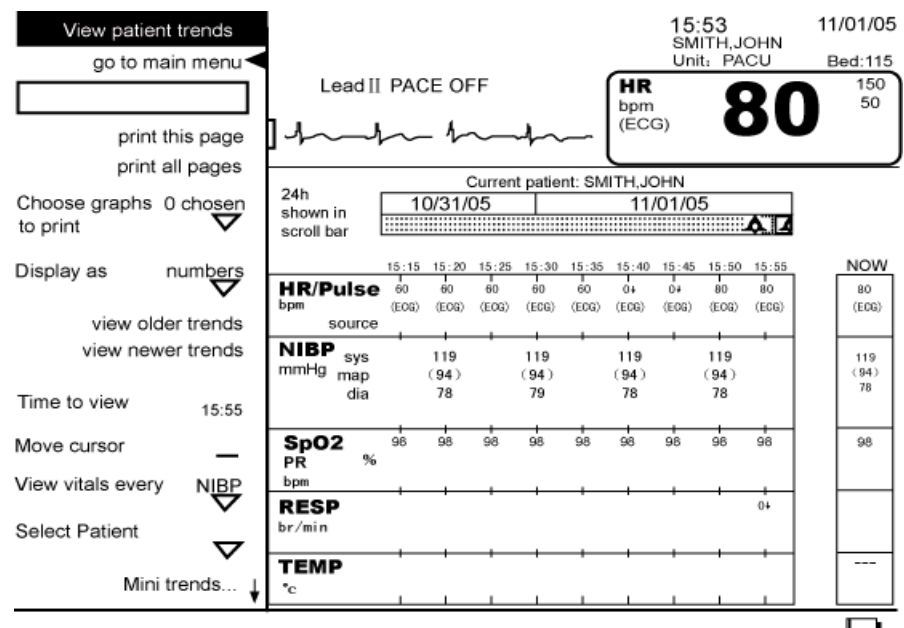
How to use patient trends

1. To access trends, push the **Trend** hardkey or select the **view patient trends** option in the **Main Menu**.
2. To set the mode in which trended information is displayed, select **Display as**. Select either **numbers** or **graphs**.
3. To view additional trends page by page, select **view older trends** or **view newer trends**.

4. To view a specific period of time, select **time to view**.
 - a. To view more recent data, turn the Trim Knob clockwise.
 - b. To view older data, turn the Trim Knob counterclockwise.
5. To view a different subset of data (determined by either time intervals or a parameter that is not continuously updated), select **view vitals every**, and make a selection.
6. To view data from the previous patient, choose **Select Patient** and then choose **Previous**.

NOTE: If your monitor is configured for this feature, the **Save previous patient data** option under the menu item **Config settings** will be set at **yes**.

View Patient Trends Menu: Numbers



print this page

This option lets you print data currently displayed on the trends screen. It is available when the printer is not busy, trended patient data other than an admit mark is displayed, and the **Display as** option is set to **numbers**.

print all pages

This option lets you print all stored data for the currently displayed trends. It is available when the printer is not busy, trended patient data other than an admit mark is displayed, and the **Display as** option is set to **numbers**.

NOTE: To cancel a print request, push the **Print** hardkey once.

Choose graphs to print

This option is selectable, but has no effect on numeric trends. It is used to select which graph to print when in **graphs** mode.

Display as

This option lets you choose the mode in which you view the trended data. Two modes are available: **numbers** or **graphs**.

view older trends

This option lets you scroll page by page through the older trends.

view newer trends

This option lets you scroll page by page through the newer trends.

Time to view

This option lets you view data from different times over the last 24 hours. The time displayed above the right-hand column of the 9-column group is the same as the time shown next to the **Time to view** option. When you select the **Time to view option**, a box appears around the time. As you turn the Trim Knob clockwise, the time in the box moves forward and the Viewing Window in the scroll bar moves to the right. As you turn the Trim Knob counterclockwise, the time in the box moves backward and the Viewing Window moves to the left. When the Trim Knob stops, the new time in the box appears above the right-hand column of the 9-column group and the data on the screen change accordingly. When you have found the desired data, push the Trim Knob to confirm your choice.

Move cursor

This menu option lets you view the time and values associated with trended graphical data. Once the CURSOR column is activated, you can switch between graphs and numbers modes. The CURSOR column remains activated until the trends screen is closed. Once you select this option, a cursor line appears in the trended data area. Turn the Trim Knob to move the cursor line across the trended data. As the cursor line touches a plotted point on the graphical trends, the corresponding time and values appear in the CURSOR column. This option is unavailable when no trend data is available, or **NIBP** or **TEMP** or **1 min** is the confirmed selection of the **View vitals every** option.

View vitals every

This menu option provides you with two ways of viewing trended information. For continuously updated parameters, you can choose to have the data displayed in **1 min, 5 min, 10 min, 15 min, 30 min, 1 h, 1.5 h, 2 h, 3 h** intervals, or as **NIBP** or **TEMP**. (**NIBP** and **TEMP** are considered episodic – and listed independently – because they are not continuously updated.) Data of parameters not continuously updated are displayed in the time interval when the measurement was taken (e.g., **NIBP** and **TEMP**). These time intervals will also include trends for other vital signs. This option is available when **Display as** is set to **numbers**.

Select Patient

This menu option lets you view data from either the current or the previous patient when the **Save previous patient data?** option in the **Config settings** menu option is set at **yes**, and there is previous patient data available for the viewing mode you have selected. When the **Save previous patient data** option is set at **no**, you can view data from only the current patient.

Mini trends

The mini trends window is displayed at the bottom of the main monitoring screen. It is limited to displaying only the most recent data and only that of the Current patient. The **mini trends** window is an abbreviated version of the full trends screen. Unlike the full trends screen, mini trends only displays HR/Pulse, SpO₂, NIBP, and impedance respiration (RESP). When the menu is open, you can view four columns of data, and when it is closed you can view 10 columns of data. Mini trends does not contain a NOW column. The trended information in the mini trends window appears in either graphs or numbers mode, whichever the default setting.

View trends on main screen?

This menu option lets you turn mini trends on or off. The mini trends window appears at the bottom of the main monitoring screen.

Display as

This option lets you choose the mode in which you view trended data in the mini trends window. Two modes are available: **numbers** or **graphs**.

View vitals every

This menu option is available when the **Display as** option is set to **numbers**. It provides you with two ways of viewing trended information in mini trends. For continuously updated parameters, you can choose to have the data displayed in **1 min, 5 min, 10 min, 15 min, 30min, 1 h, 1.5 h, 2 h, or 3 h** intervals or as **NIBP**.

Trends of parameters not continuously updated are displayed in the time interval when the measurement was taken (i.e., NIBP). These time intervals will also include trends for other vital signs.

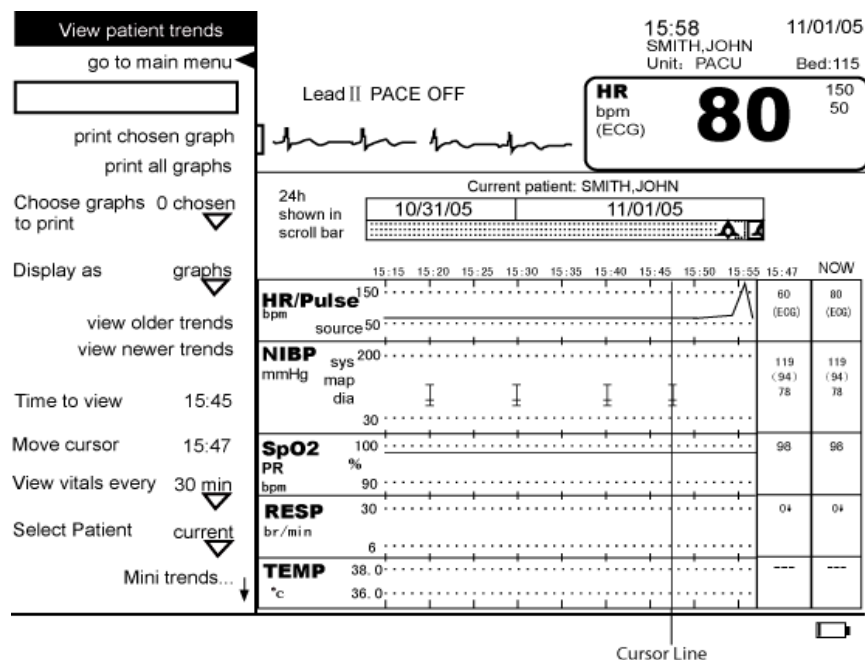
View vitals for

This menu option is available when the **Display as** option is set to **graphs**. It lets you choose the span of time to view the mini trends window. You can choose **50 min**, **100 min**, **2.5 h**, **5 h**, **10 h**, **15 h**, **20 h**, or **24 h** intervals. (Dashes are unavailable and cannot be chosen.)

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

View Patient Trends Menu: Graphs



print chosen graphs

This option lets you print chosen graphs currently displayed on the trends screen. (Go to **Choose graphs** option to make selection.) If no graphs have been chosen and this option is selected, the top two waveforms are printed. It is available when the printer is not busy, trended patient data other than an admit mark is displayed, and the **Display as** option is set to **graphs**.

print all graphs

This option lets you print all graphs currently displayed on the trends screen. It is available when the printer is not busy, trended patient data other than an admit mark is displayed, and the **Display as** option is set to **graphs**.

Choose graphs to print

This option lets you choose which graphs you wish to print. It is used to select which graph to print when in **graphs** mode.

Display as

This option lets you choose the mode in which you view the trended data. Two modes are available: **numbers** or **graphs**.

view older trends

This option lets you scroll page by page through the older trends.

view newer trends

This option lets you scroll page by page through the newer trends.

Time to view

This option lets you view data from different times over the last 24 hours. The time displayed above the right-hand column of the 9-column group is the same as the time shown next to the **Time to view** option. When you select the **Time to view** option, a box appears around the time. As you turn the Trim Knob clockwise, the time in the box moves forward and the Viewing Window in the scroll bar moves to the right. As you turn the Trim Knob counterclockwise, the time in the box moves backward and the Viewing Window moves to the left. When the Trim Knob stops, the new time in the box appears above the right-hand column of the 9-column group and the data on the screen change accordingly. When you have found the desired data, push the Trim Knob to confirm your choice.

Move cursor

This menu option lets you view the time and values associated with trended graphical data. Once you select this option, a cursor line appears in the trended data area. Turn the Trim Knob to move the cursor line across the trended data. As the cursor line touches a plotted point on the graphical trends, the corresponding time and values appear in the CURSOR column. This option is unavailable when no trend data is available.

View vitals for

This menu option lets you choose the span of time to view. You can choose **40 min**, **80 min**, **2 h**, **4 h**, **8 h**, **12 h**, **16 h** or **24 h**. (Dashes are unavailable and cannot be chosen.) It is available when the **Display as** option is set to **graphs**.

Select Patient

This menu option lets you view data from either the current or the previous patient when the **Save previous patient data?** option in the **Config settings** menu option is set at **yes**, and there is previous patient data available for the viewing mode you have selected. When the **Save previous patient data** option is set at **no**, you can view data from only the current patient.

Mini trends

The mini trends window is displayed at the bottom of the main monitoring screen. It is limited to displaying only the most recent data and only that of the Current patient. The **mini trends** window is an abbreviated version of the full trends screen. Unlike the full trends screen, mini trends only displays HR/Pulse, SpO₂, NIBP, and impedance respiration (RESP). When the menu is open, you can view four columns of data, and when it is closed you can view 10 columns of data. Mini trends does not contain a NOW column. The trended information in the mini trends window appears in either graphs or numbers mode, whichever the default setting.

View trends on main screen

This menu option lets you turn mini trends on or off. The mini trends window appears on the waveform screen.

Display as

This option lets you choose the mode in which you view the mini trended data. Two modes are available: **numbers** or **graphs**.

View vitals every

This menu option is available when the **Display as** option is set to **numbers**. It provides you with two ways of viewing trended information in mini trends. For continuously updated parameters, you can choose to have the data displayed in **1 min**, **5 min**, **10 min**, **15 min**, **30min**, **1 h**, **1.5 h**, **2 h**, or **3 h** intervals or as **NIBP**. Trends of parameters not continuously updated are displayed in the time interval when the measurement was taken (i.e., NIBP). These time intervals also include trends for other vital signs.

View vitals for

This menu option is available when the **Display as** option is set to **graphs**. It lets you choose the span of time to view for the mini trends window. You can choose **50 min, 100 min, 2.5 h, 5 h, 10 h, 15 h, 20 h, or 24 h** intervals. Dashes appear at the bottom of this list as placeholders. They are unavailable and cannot be chosen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

7 Recorder

For your notes

Description

Using the recorder/printer, you can obtain thermal-paper strip recordings from the Dash 2500 Patient Monitor. The recorder/printer prints real-time data (e.g., waveforms) and non-real-time (static) data (e.g., trends). Real-time waveforms can be printed in three modes: continuous, timed, and alarm.

Patient identification information (name, patient type, unit number, and bed number), date, time, monitor model number, software revision, and GE company name are printed at the beginning of each strip. Three-second time intervals are marked on all real-time printouts. These time markers appear as a dash at the top and bottom of the recorder strip. Vital signs, information about parameter status, and alarm status information are printed on the recorder strip. When printing graphical trends, up to two graphs can be printed simultaneously. The times that appear on the screen in the trend data area are also printed along the top of the strip from left to right, oldest to newest. The date of the earliest trend data is printed to the left of the oldest time.

A delayed memory option, available in the password-protected configuration menu, allows you to print waveforms and vital signs that appeared on the screen 2 to 12 seconds in the past. Recorded waveforms for ECG are filtered, based on their current settings. ECG filter settings are printed next to the waveform label on the recorder strip.

Print Hardkey



The **Print** hardkey lets you start a real-time trace recording (continuous or timed), as well as stop all recordings in progress. Whenever any type of recording is in progress (real-time or static), a quick-push of the **Print** hardkey stops that recording. The **Print** hardkey is available as long as a waveform parameter is available. However, The **Print** hardkey is available to start a trace recording as long as a waveform parameter is available. If a recording is in progress and all waveform parameters fail or become unavailable, that recording will complete as expected. However, the **Print** hardkey will not be available to start another trace recording until a waveform parameter again becomes available. If the **record key printout** option is set to **at CS**, quick-pushing the **Print** hardkey starts a recording at the central station.

NOTE: You can use the **Print** hardkey to print to a central station if the Dash 2500 Patient Monitor does not contain the optional recorder/printer, the printer becomes disabled, or if configured to do so.

Printing in Continuous Mode

To print in continuous mode, push-and-hold the **Print** hardkey. You can control the length of the strip by push-and-holding the hardkey to start printing and pushing again to stop printing. The chart speed is fixed at 25.0 mm/s. If patient alarms occur during printing, they are annotated on the strip. Patient identification is printed at the beginning of the strip. Annotation of vital signs and

alarm status information is printed at the beginning and then repeated every 10 seconds. In terms of printing priority, a request for a continuous mode strip interrupts any other printings in progress. An alarm strip in progress continues when a continuous strip is requested, and the new recording mode is annotated on the strip.

Printing in Timed Mode

To print in the timed mode, you can quick-push the **Print** hardkey (if configured to do so) or select the **start timed recording** option in the **Setup recorder** menu. The length of the strip can range from 8 to 30 seconds and three chart speeds are available.

NOTE: Timed mode does not initiate a recording at a central station.

Alarm Mode Printing

When the **Print on Alarm?** option is set to **yes**, auto mode printing is on and a strip prints automatically when a warning or crisis patient alarm occurs. Alarm mode overrides all other modes of printing except continuous. The length of the strip depends on the type of alarm. When a warning alarm occurs, the recorder will print according to the preset **Length of strip** option in the **config settings** menu under **setup continuous** option. When a crisis alarm occurs, the recorder will continue to print a strip until the greatest amount of time, determined by the following, expires: a) all crisis alarm conditions in progress have been removed in addition to the amount of time preset in the **Delayed memory** option in the **config settings** menu under the **delayed memory setup timed** option has expired or b) until the preset **Length of strip** option is printed.

When printing, patient alarm messages are annotated as they occur. Patient identification is printed at the start of the strip and annotation of vital signs and alarm status information will be repeated every 10 seconds. The speed is fixed at 25.0 mm/s and has the same delayed memory setting as continuous strip mode.

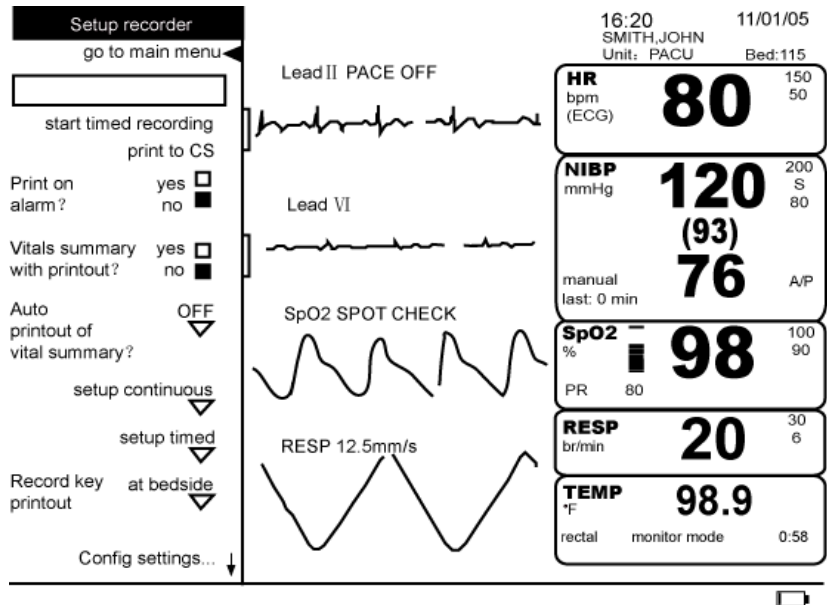
NOTES

- Alarms set to message priority will not be annotated on recorder strips.
- System alarms do not cause an alarm print to automatically start.

Printing Priorities

The recorder/printer prints continuous, alarm, timed, and static printouts (e.g., trends, freeze, etc.) in order of priority. Continuous mode takes priority over all other printing. The alarm mode is next in priority and can override timed and static printouts. Timed mode and static printouts are equal in printing priority.

Recorder/Printer Menu



start timed recording

You can use this option to initiate a timed mode printout. The length of the strip can be configured between 8- to 30- seconds either in the user menu or in the password-protected configuration menu. If patient alarms occur during printing, they are not annotated on the timed strip. If the recorder/printer receives a request for a continuous or alarm mode strip, the timed mode recording will be interrupted and stopped.

NOTE: If you have changed an ECG filter or lead setting, allow a minimum of 12 seconds before starting a timed recording in order for the new setting to appear on the recorder strip.

print to CS

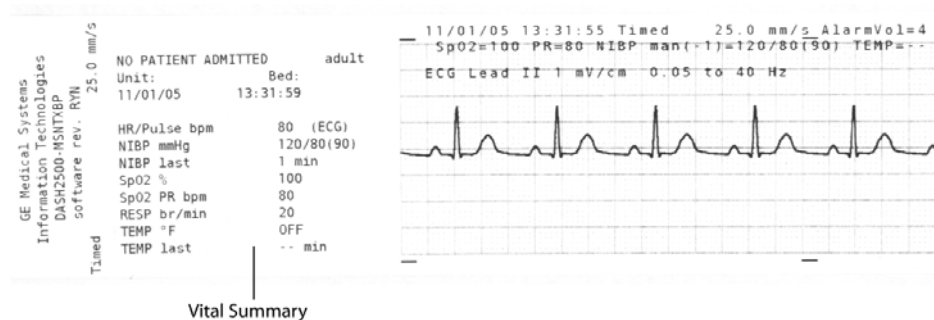
You can use this option to generate a timed central station recording. This menu option is available only when communication with the central station has been established. To initiate a timed central station recording, select the **print to CS** option in the **Setup recorder** menu or the **other system settings** menu. When the **Record hardkey printout** option is set to **at CS**, you can also quick-push the **Print** hardkey to start a central station recording. After quick-pushing the hardkey, a helpline appears momentarily at the bottom of the screen stating, **Print command sent to central station**.

Print on alarm?

You can use this option to choose whether recordings will print automatically when a patient warning or crisis alarm occurs. The waveform(s) selected for a continuous mode strip appear on an alarm strip as well. The length of the strip is set in the password-protected configuration menu at 20 to 30 seconds. In response to a crisis alarm, however, the strip will continue to print past the set time if the alarm condition has not been corrected. If additional patient alarms occur during printing, they are annotated on the alarm strip. The speed is fixed at 25 mm/s and has the same delayed memory setting as continuous strip mode.

Vitals summary with printout?

You can use this option to have a summary of vitals printed whenever you print a recording. Choose **yes** or **no**.



Auto printout of vitals summary?

This option lets you choose to have an automatic vitals summary printout whenever an NIBP determination completes (**NIBP ONLY**) or whenever NIBP or TEMP determinations complete (**NIBP or TEMP**). Choose OFF if you do not want an automatic summary printout upon completion of either.

If both NIBP and TEMP determinations are in progress, the auto print summary is held off until both determinations are completed. If an auto print is initiated while the recorder is busy, the auto print data is held in memory until the recorder becomes available. Only one set of data can be held in memory for an auto print. If the auto print is on hold and another NIBP/TEMP determination is completed, the new data will be printed once the recorder becomes available.

setup continuous

The extended menu that appears when you select this option lets you choose up to two waveforms to be printed in the continuous or alarm modes (the ECG waveform is automatically chosen as long as the parameter is available). If you do not specify a waveform, the waveform with the highest priority will be printed.

setup timed

The extended menu that appears when you select this option lets you choose the waveforms to be printed, the chart speed, and the length of the strip. You can select up to two waveforms; if you do not specify a waveform, the waveform with the highest priority will be printed. You can set the chart speed at **12.5**, **25.0**, or **50.0** mm/s. You can set the length of the strip between 8–30 seconds.

NOTE: If the length of the strip is set to less than 16 seconds, the 12.5 chart speed is unavailable; or if the chart speed is set to 12.5, the length of the strip cannot be set for less than 16 seconds.

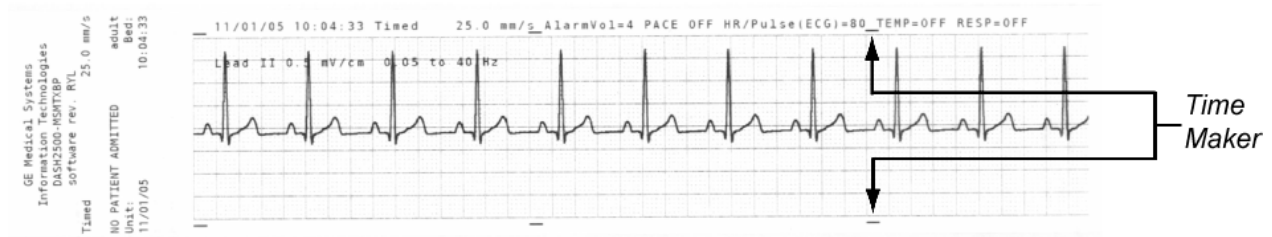
Record key printout

This option lets you choose where the Monitor prints with a quick-push of the **Print** hardkey. Choose **at CS** (central station) or **at bedside**.

NOTE: If the recorder/printer is disabled or not included with the Monitor, **at CS** becomes the default setting.

Sample Printout

Annotation: reflects the vital signs derived at the point in time where the annotation begins.



Vital signs in the annotation are derived based on prior information. The amount of prior information considered is dependent on the parameter-specific averaging interval.

Accessories

The Recorder/Printer requires thermal paper in 50 mm wide.

Storage

Store thermal paper in a cool, dry place. The printed strip (thermal paper recording) should not be

- exposed to direct sunlight,

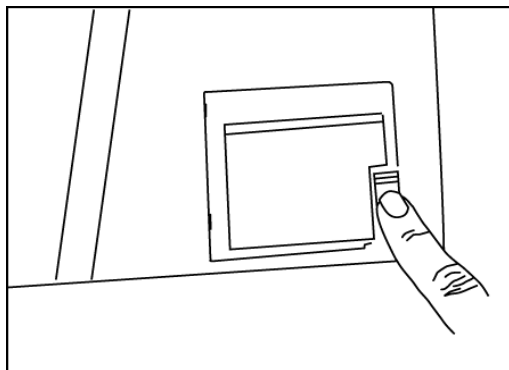
- exposed to temperatures over 100°F/38°C, or relative humidity over 80%, or
- placed in contact with adhesives, adhesive tapes, or plasticizers such as those found in all PVC page protectors.

NOTE: When in doubt about long-term storage conditions, store a photocopy of the thermal paper recording

Loading the Printer Paper

How to load paper in the recorder/printer

1. Open the recorder/printer door by pushing the door latch.



2. Remove the paper core.
3. Place a new paper roll between the tabs of the paper holder. The paper should unroll from underneath the paper roll (refer to the following illustration).



4. Begin to close the door while still holding onto and pulling about 2-1/2 to 3 inches (6 to 8 cm) of paper; then close the door completely. You should hear a snap as the door latch is engaged.
5. Ensure that the paper is properly aligned in the paper slot.
6. The recorder will automatically print out a short, annotated strip.

NOTE: If you load paper in the wrong direction, the recorder/printer will attempt to print out an annotated strip but a blank strip will result instead.

Alarms

Recorder/Printer Alarms		
Name of Alarm	Cause	Response
Recorder Out of Paper	recorder is out of paper or paper is jammed	message appears in the <i>SelectBox</i> and alarm message field
Recorder Door is Open	recorder door is open	message appears in the <i>SelectBox</i> and alarm message field
Recorder Cannot Print	recorder is trying to trace an abnormally noisy waveform or recorder has an error	message appears in the <i>SelectBox</i> and alarm message field

8 Heart Rate/Pulse

Procedure Checklist

1. Prepare patient.
2. Connect monitoring lines.
3. Select **HR/Pulse** from the **Setup parameters** option in the **Main Menu**.
4. Set up monitoring parameters.

Description

Heart rate/pulse (HR/Pulse) in the Dash 2500 Patient Monitor can be derived from one of several sources. In descending order of priority, they are ECG, pulse oximetry (SpO₂), and noninvasive blood pressure (NIBP). Instead of choosing a single source of HR/Pulse, you can activate the auto feature to choose the best available source.

A label designating the source of the HR/Pulse data appears in the HR field of the screen. The color of this value changes based on the current source (optional). Beats are indicated in the HR field by a blinking heart symbol that is synchronized with an optional audible QRS (pulse) tone.

When ECG is the source, HR/Pulse values are calculated over the previous 8 beats. The HR field is labeled with ECG.

When SpO₂ is the source, HR/Pulse values are derived from the pulse oximetry signal, and the HR field is labeled SpO₂. When SpO₂ is the source for HR/Pulse, pulse rate (derived from SpO₂) appears only in the HR field (dashes appear for PR in the SpO₂ field when the **View SpO2 PR?** option is set to **yes**). In addition, if the QRS volume is on, the pitch of the pulse tone increases with oxygen saturation value.

The HR/Pulse parameter has audible and visible alarms to let you know when the HR/Pulse is outside the high or low limit. When the source of HR/Pulse indicates a zero rate (e.g., detection of **ECG ASYSTOLE**, **SpO2 LOST PULSE**), the HR/Pulse value is forced to zero, resulting in a low limit alarm.

NIBP cannot be chosen as a source for HR/Pulse, it only becomes the current source of HR/Pulse when no other rate source parameters are available. When NIBP is the current source, another rate source parameter takes over as the source when it becomes available.

Indications and Contraindications

The Dash 2500 Patient Monitor is indicated for monitoring heart rate/pulse. This device is not designed, sold, or intended for use except as indicated.

General Notes

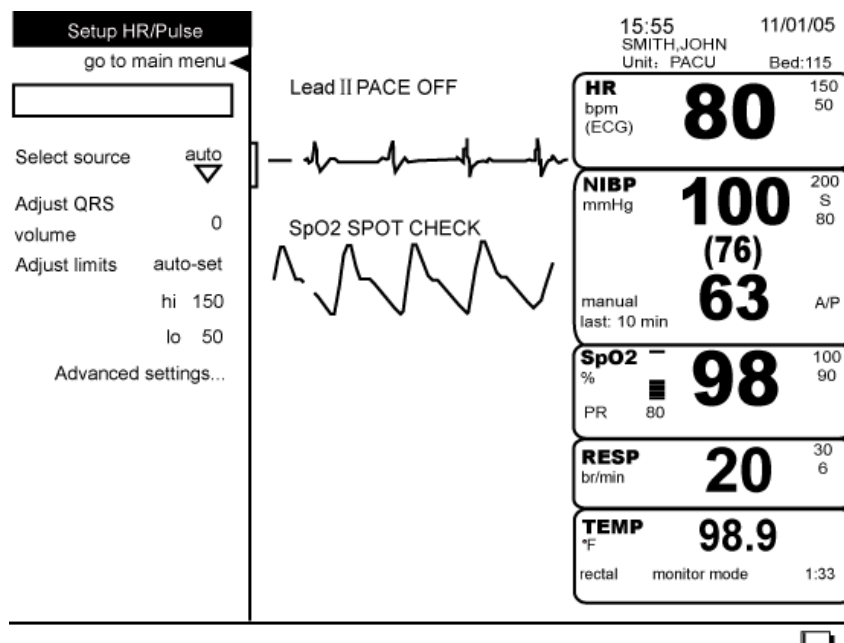
- Because the various sources measure or derive HR/Pulse differently from each other, changing from one source to another may change the value in the HR field.
- Because it is not a continuously monitored parameter, NIBP cannot be chosen as a source for HR/Pulse. NIBP will become the source only if no other source is available.
- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease heart rate.

- T waves that are greater than 100% of the amplitude of the QRS may be counted as pulses.
- If an SpO₂-derived pulse rate is erratic, the pulse oximeter parameter may be unable to measure the pulse and may cause an alarm.

Procedures

1. Prepare the patient according to the instructions for the parameter you are using.
2. Connect the Monitoring lines.
3. Choose **HR/Pulse** from the **Setup parameters** option in the **Main Menu**, and set up the desired monitoring parameters.

HR/Pulse Menu



Select source

This option lets you choose the source of the HR/Pulse data to be displayed on the screen. The current source is shown in this field, and the other options are in an extended menu. The options are **auto** and the sources that are available from the active parameters. If you choose **auto**, the HR/Pulse parameter will choose the best available source.

Adjust QRS volume

This option lets you adjust the volume of the tone that sounds each time a QRS complex is detected. If you set the volume to zero, no tone will sound.

Adjust limits

The adjustable and auto-set alarm limits are shown in the table. Choose **hi** to change the high alarm limit and **lo** to change the low alarm limit. The system maintains appropriate separation between the high and low limits. Choose **auto-set** to use the patient's current readings in setting the high and low limits.

HR/Pulse Alarm Limits				
Heart Rate/ Pulse	Adjustable		Auto-set choice: 20%, 30%, 40%	
	Low	High	Low	High
adult/ped/neonate	30-245 (bpm)	35-250 (bpm)	current reading minus chosen percentage	current reading plus chosen percentage

Advanced settings

Limit alarms priority

This option lets you choose the priority of the limit alarms.

Change color based on source?

This option lets you change the color of the HR/Pulse vital signs information on the Monitor screen to match with the HR/Pulse source parameter color. Choose **yes** to have the color appear based on the source. Choose **no** to select individual HR/Pulse color.

Select HR/Pulse's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor screen.

Specifications

Specifications	
ECG	
Heart rate accuracy	30 to 300 bpm ± 3 bpm or 3% of reading, whichever is greater
Time to alarm	high heart rate < 10 s per AAMI EC13 - 2002 low heart rate < 10 s per AAMI EC13 - 2002 cardiac standstill < 10 s per AAMI EC13 - 2002 tachycardia waveforms < 10 s per AAMI EC13 - 2002
NELLCOR SpO₂	
Range	20 - 250 bpm
Accuracy and Tolerance	20 to 250 bpm ±3 digits
Low Perfusion	20 to 250 bpm ±3 digits
MASIMO SpO₂	
Range	25 - 240 bpm
Accuracy and Motion Tolerance	
Without Motion	25 to 240 bpm ±3 digits
With Motion	normal physiologic range 25 to 240 bpm ±5 digits
Noninvasive Blood Pressure	
Range	
Adult/ped	30 - 200 bpm
Neonate	30 - 220 bpm
Accuracy	± 3.5%
Alarm Limits	
Range	30 - 250 bpm

Alarms

HR/Pulse Alarms		
Name of Alarm	Cause	Response
HR High	value is greater than “hi” alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field
HR Low	value is less than “lo” alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field

9 ECG

Procedure Checklist

1. Plug cable connector into ECG parameter.
2. Plug lead wires into patient cable block.
3. Connect lead wires to electrodes.
4. Choose electrode sites.
5. Prepare patient's skin.
6. Apply electrodes to patient.
7. Provide support for cable and block.
8. Select **ECG** from the **Setup parameters** option in the **Main Menu**.
9. Set up monitoring parameters.

Description

Electrocardiographic (ECG) monitoring is accomplished in the Dash 2500 Patient Monitor by the EK-Pro* algorithm that uses 3-electrode or 5-electrode configuration. The 3-electrode (LL, LA, RA) configuration derives a waveform from lead I, II, III and displays this waveform as the primary lead. The 5-electrode (LL, RL, LA, RA, V) configuration derives waveforms from lead I, II, III, aVR, aVL, aVF, VA and displays this waveform as the primary lead. In 5-electrode configuration, another waveform can be displayed as the secondary lead. Leads can be changed without changing electrode sites; a waveform cascade feature is included in 5-electrode configuration. When 3 electrodes (RA, LL, LA) are connected to the patient, waveforms I, II, and III are available to view and/or record. When 4 electrodes (RA, LL, LA, RL) are connected to the patient, waveforms I, II, III, aVR, aVL or aVF are available to view and/or record. When 5 electrodes are connected to the patient, waveforms I, II, III, aVR, aVL, aVF or a single VA lead (i.e., chest lead) are available to view and/or record. ECG waveforms can be displayed at sweep speeds of 12.5 mm/s, 25.0 mm/s, and 50.0 mm/s. The vertical scale on the display is indicated by the left-hand bracket which shows the scale of 1 mV high. The height of the waveform may be decreased by one half and one fourth or increased by a factor of 2. You can capture up to 16 seconds of a waveform by pushing the **Freeze** hardkey.

When monitoring a patient with a cardiac pacemaker, you must activate a pacer spike detection feature for the selected lead.

The ECG parameter has audible and visible alarms to let you know when a lead is disconnected, to warn you of asystole, and to inform you when significant noise is making it impossible to calculate a heart rate.

ECG is the primary source of heart rate (HR/Pulse) data, which is displayed in the HR vital signs field. Instructions for monitoring HR/Pulse are in the Heart Rate/Pulse section of this manual. The color of the HR/Pulse value may change based on the current source.

Indications and Contraindications

The ECG parameter is indicated for use in obtaining electrocardiographic waveforms and heart rate as a component of the Dash 2500 Patient Monitor. This device is not designed, sold, or intended for use except as indicated.

WARNINGS

Make sure that equipment using high-intensity radio frequencies (e.g., an electrosurgical unit) is properly grounded to reduce the risk of inducing current into cables and electrodes. Such current may interfere with the ECG signal.

When making connections, attach the lead wires only to the cable and attach the cable only to the ECG connector on the side of the Monitor.

*EK-Pro is a registered trademark of GE Medical Systems *Information Technologies*.

WARNINGS

Ensure that ECG connectors and electrodes do not come into contact with other equipment and cables, especially other metallic objects such as bed frames, furniture, and fixtures, which may be grounded (earthed).

Pacemaker patients must only be monitored with the pacer detector activated.

During electrosurgical unit use, monitor patients in nonpaced mode. Using nonpaced mode in a pacemaker patient may result in inaccurate heart rate averaging. Pacemaker spikes may be interpreted as QRS complexes, and the screen may continue to display a heart rate during asystole or cardiac standstill.

Do not use the ECG parameter during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of ECG measurements. Always remove ECG from the MRI environment before scanning a patient.

When using a defibrillator on a patient being monitored, carefully follow the instructions and cautions provided in the manual for the defibrillator. Ensure that electrodes and patient cables do not contact metal or other conductive objects or surfaces, or grounded parts of equipment.

When electrosurgical equipment is being used with a patient being monitored, place the electrodes, patient leads, and cables as far away as possible from the surgical site. Also, keep ECG leads away from other equipment. These precautions will reduce the hazard of burns in the event of a defect in the electrosurgical equipment neutral electrode connection.

Line Isolation monitor transients may resemble actual cardiac waveforms and inhibit heart rate alarms.

Use of electrodes with dissimilar metal may cause excessive or accelerated electrode polarization.

False low heart rate indicators or false asystole calls may result with certain pacemakers because of electrical overshoots.

An artificial pacemaker spike is displayed in place of the actual pacemaker spike. All pacemaker spikes appear uniform. Do not diagnostically interpret pacemaker spike and shape.

Lethal Arrhythmia alarms are not displayed if disabled by user or if a lethal arrhythmia is present during the learning phase. To display Lethal Arrhythmias, ensure that a normal rhythm is present when the learning phase is active.

WARNING

This device uses a computerized 3-electrode ECG analysis program which can be used as a tool in ECG tracing interpretation. This computerized interpretation is only significant when used in conjunction with clinical findings. All computer generated tracings should be overread by a qualified physician.

CAUTIONS

Inaccurate heart rates caused by missing QRS complexes, or counting non-QRS events, may result if ECG amplitude is low.

Pacemaker spikes occurring less than 40 ms prior to the peak of a QRS complex will cause that QRS not to be counted in the heart rate.

Use only electrodes, lead wires, and cables recommended by GE Medical Systems Information Technologies. Failure to use recommended accessories may result in inaccurate readings, damage to equipment, or loss of defibrillator protection.

The summation of leakage currents when several items of equipment are interconnected, may pose a possible hazard.

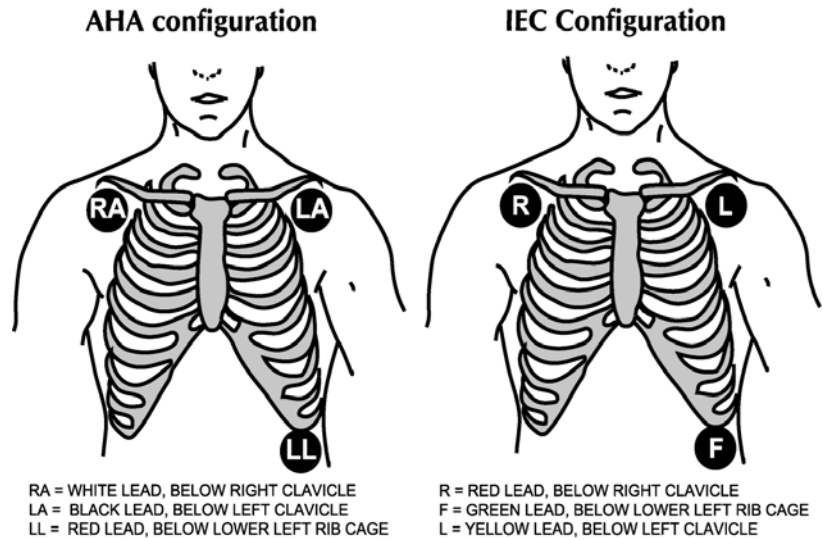
Route cables away from patient's throat to avoid possible strangulation.

ECG electrodes are tested to and meet the biocompatibility requirements of ISO 10993.

FDA POSTMARKET SAFETY ALERT – the United States FDA Center for Devices and Radiological Health issued a safety bulletin October 14, 1998. This bulletin states "that minute ventilation rate-adaptive implantable pacemakers can occasionally interact with certain cardiac monitoring and diagnostic equipment, causing the pacemakers to pace at their maximum programmed rate." The FDA further recommends precautions to take into consideration for patients with these types of pacemakers. These precautions include disabling the rate responsive mode and enabling an alternate pace mode. For more information contact:
Office of Surveillance and Biometrics, CDRH, FDA
1350 Piccard Drive, Mail Stop HFZ-510
Rockville, MD 20850
USA

Procedures

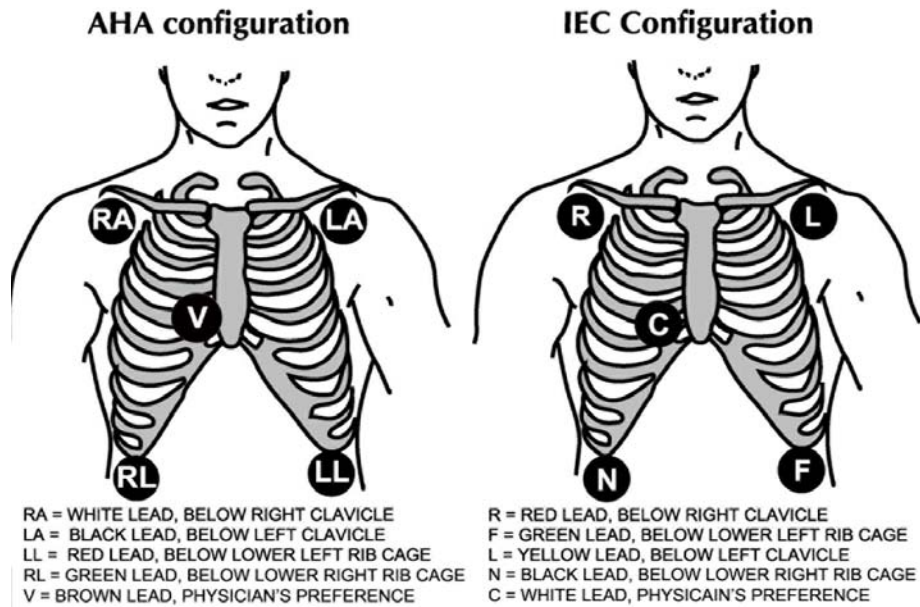
1. Plug cable connector into the Monitor.
2. Using appropriate medical criteria, choose the sites for placing the electrodes.



Possible Sites of 3-Electrode Placement

Viewable Settings			
Number of Electrodes	Waveforms available	Electrodes Required	Waveform Formulas
3	I, II, III	LA, RA, LL	I = LA - RA, LL reference II = LL - RA, LA reference III = LL - LA, RA reference

AHA Color Coding		IEC Color Coding	
Patient Connection Identifier (3 leads)	United States, Latin America, Canada	Patient Connection Identifier (3 leads)	International
RA	white	R	red
LA	black	L	yellow
LL	red	F	green



Possible Sites of 5-Electrode Placement

Viewable Settings			
Number of Electrodes	Waveforms available	Electrodes Required	Waveform Formulas
4	I, II, III, AVR, AVL, AVF	LA, RA, LL, RL	$I = LA - RA$, $AVL = LA - (LL + RA)/2$ $II = LL - RA$, $AVR = RA - (LL + LA)/2$ $III = LL - LA$, $AVF = LL - (RA + LA)/2$
5	I, II, III, AVR, AVL, AVF, VA	LA, RA, LL, VA, RL	$I = LA - RA$, $AVL = LA - (LL + RA)/2$ $II = LL - RA$, $AVR = RA - (LL + LA)/2$ $III = LL - LA$, $AVF = LL - (RA + LA)/2$ $V = VA - (LL + LA + RA)/3$

AHA Color Coding		IEC Color Coding	
Patient Connection Identifier (5 leads)	United States, Latin America, Canada	Patient Connection Identifier (5 leads)	International
V	brown	C	white
RA	white	R	red
LA	black	L	yellow
LL	red	F	green
RL	green	N	black

3. Prepare the patient's skin for the electrodes. The following suggestions may be helpful in making sure that the electrodes have good contact with the skin:
 - ◆ Shave the hair from each electrode site.
 - ◆ Cleanse each site with alcohol to remove skin oils.
 - ◆ Use mild abrasion to reduce the impedance between the skin and the electrode. To do this, briskly rub each site with a gauze pad.
 - ◆ If the patient is diaphoretic, dry the electrode site thoroughly so the adhesive pad will adhere to the skin. If the electrode site cannot be kept dry, you can apply an antiperspirant spray and a thin coat of tincture of benzoin to the peripheral area. Do not apply the spray and tincture to the surface of the skin where you intend to place the gel area of the electrode.
4. Connect the lead wires to the electrodes. (Refer to the table for the IEC and AHA color-coding of lead wires.)

CAUTION

Before making any connections, inspect all cables, lead wires, and connectors to ensure that they are not damaged or significantly worn.

5. Following your hospital's or physician's protocol, apply each electrode to the patient at the appropriate site.

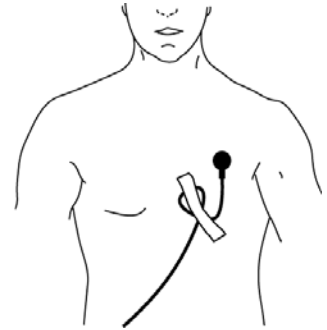
CAUTION

Before applying the electrodes, check the expiration date.

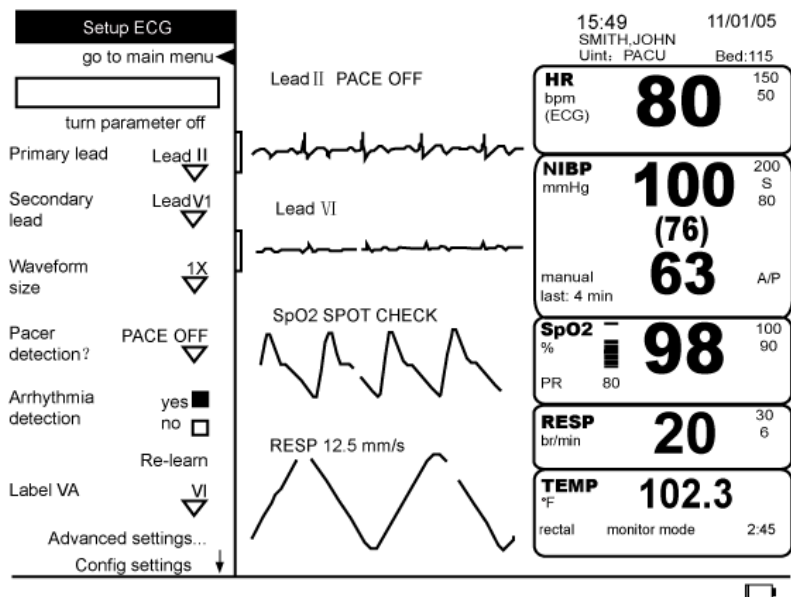
6. Plug the free end of each lead wire into the proper color-coded receptacle in the patient cable block.
7. Plug the connector end of the cable into the ECG connector on the side of the Monitor. Look at the ECG primary waveform located at the top of the display. Verify that no other messages are displayed above the waveform after the initial **LEARNING** message is removed. Verify that ECG is the source of the HR/Pulse value.
8. Following your hospital's or physician's protocol, support the cable and the cable block so that their weight does not stress the connections to the patient.
9. Choose ECG from the **Setup parameters** option in the **Main Menu** and set up the desired monitoring parameters.
10. Discard the single-use electrode after monitoring.

Stress Loop Stabilization

To help minimize ECG artifact, a lead wire pulling at the electrode, or rotating of the lead wire, stress loop stabilization is recommended. Loop the lead wire approximately 2 inches away from the electrode/lead wire connection, and adhere the stress loop with tape to the patient.



ECG Menu



turn parameter off

This option lets you suspend all monitoring and alarms for ECG. When you choose this option, the message **offline-ECG** appears in the **setup parameters** option. To resume monitoring, choose the **offline-ECG** option from the **setup parameters** option.

Lead selection

This option is active in 3-electrode configuration. The ECG parameter calculates HR/Pulse from the selected lead, analyzes this lead for pacemaker pulses, and sends this waveform to the auxiliary output for use as the defibrillation-synchronization lead. You can choose lead I, II, or III as the selected lead. The ECG waveform derived from this lead is at the top of the screen, and the lead designation appears above the waveform.

Primary Lead

This option is active in 5-electrode configuration. You can choose **Lead I, II, III, aVR, aVL, aVF** or a single **VA** lead as the primary lead. The ECG waveform derived from this lead is at the top of the screen, and the lead designation appears above the waveform. The default primary lead is configurable in the password-protected configuration mode and reverts back to the default setting if discharging or admitting a patient. The default setting is **Lead II**.

Secondary Lead

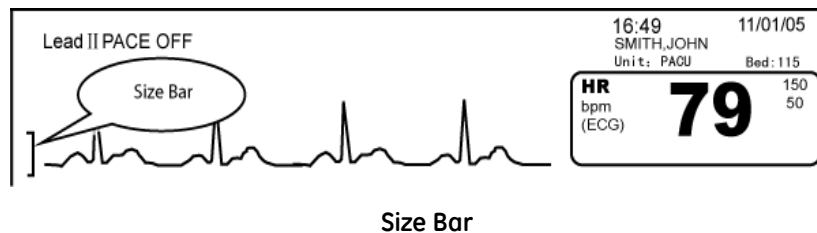
This option is active in 5-electrode configuration. You can choose a secondary lead from among **I, II, III, aVR, aVL, aVF** or a single **VA**, with the exception of the lead you have designated as the primary lead. Or you can select **None** not to display the secondary lead. The secondary lead waveform will be displayed directly beneath the primary lead waveform but is viewable only when space is available. (Five waveforms are viewable when mini trends is off and three are viewable when mini trends is on; the secondary lead waveform has the lowest priority for viewing.)

Waveform size

This option enables you to increase or decrease the size of all the ECG waveforms displayed on the screen. This may be necessary when diagnosing or problem solving. Normal size (1X) is recommended unless circumstances require otherwise.

NOTES

- If a size other than 1X is used, the size is displayed on the left side of the screen next to the ECG waveform.
- Size 2X will lower the QRS detection threshold. This may be helpful for low amplitude QRS waveforms. Use with caution since baseline artifact may be detected as a QRS.
- Waveforms are recorded or printed the same size as displayed.



Pacer detection

The **Pacer detection** option enable/disable the pacemaker detection algorithm. It must be used whenever the monitored patient has a pacemaker. Pace detection choices are **PACE 1**, **PACE 2**, and **OFF**.

There are two pacemaker processing modes, **PACE 1** and **PACE 2**. The **PACE 1** and **PACE 2** modes use different algorithms for pacemaker artifact rejection. The clinician must be the judge as to which mode is better for each patient. The pacemaker detection algorithm defaults to off so if you have a patient with a pacemaker, you will have to turn the algorithm on.

The **PACE 2** mode is much more conservative in recognizing paced QRS morphologies and is recommended for use whenever possible. It is designed to minimize the possibility of counting pacemaker artifact as QRS complexes during ASYSTOLE. If the Monitor does not adequately detect paced beats in the **PACE 2** mode, then user may wish to try the **PACE 1** mode.

The **PACE 1** mode allows detection of the largest variety of paced QRS morphologies. As a direct consequence, this mode does have a higher risk of counting pacemaker artifact as QRS complexes during ASYSTOLE. For this reason, it is imperative that the user keep patients with pacemakers under close observation. It is also recommended that the user set the low heart rate limit on the Monitor close to the minimum pacing rate.

When either pace mode is enabled, the software places an artificial spike on the waveform whenever the pacemaker triggers. When pacemaker detection is enabled, it is indicated by either **PACE 1** or **PACE 2** being displayed adjacent to the lead selection display.

In most cases, **PACE 2** mode will effectively monitor a pacemaker patient. However, if you are experiencing problems, select the **PACE 1** mode as an option, and observe all cautions as described for **PACE 1** mode.



NOTES

- Use standard lead placement for pacer detection. Pacer detection is done in the primary or selected lead. Go to the **Lead selection** option and choose the best lead for accurate HR detection. If you have a monitor with 5-electrode configuration, go to the **Primary Lead** option and choose the best lead for accurate HR detection.
- Large surface potentials such as those encountered with external (transcutaneous) pacing may result in an inability to display ECG waveforms. Reducing the ECG size to X/2 may allow these waveforms to be displayed.
- Monitoring ECG with an external ECG monitoring device may be necessary when using non-invasive transcutaneous pacemakers.

Arrhythmia detection

This option lets you choose to detect lethal arrhythmias. The Monitor detects three types of lethal arrhythmias: Asystole, VFIB/VTACH, and VTACH. Choose **yes** or **no**.

NOTE: If Arrhythmia detection is set to **no**, it is recommended to set the HR limit alarm to **CRISIS**.

- **ASYSTOLE:** Ventricular asystole occurs whenever the displayed heart rate drops to zero.
- **VFIB/VTACH:** occurs when the ECG waveform indicates a chaotic ventricular rhythm. The VFIB processing is intended to detect the unique waveform features that are present in ventricular fibrillation, ventricular flutter, torsades de point, or multifocal ventricular tachycardia having beats that are difficult to distinguish. The criteria for the VFIB / VTACH alarm usually allows the algorithm to successfully identify these important arrhythmias within 10 seconds. However, in order to maintain the desired low false positive alarm rate, certain data conditions will occasionally cause the analysis to require a longer period of data, sometimes 10-20 seconds or more to assert the desired alarm.
- **VTACH** is categorized into three age groupings:
 - ◆ **Adult:** Occurs when a run of six or more ventricular beats is detected with an average heart rate greater than or equal to 100 beats per minute.
 - ◆ **Pediatric:** Occurs when a run of six or more ventricular beats is detected with an average heart rate greater than or equal to 140 beats per minute.
 - ◆ **Neonate:** VTACH detection is not available in the neonatal setting.

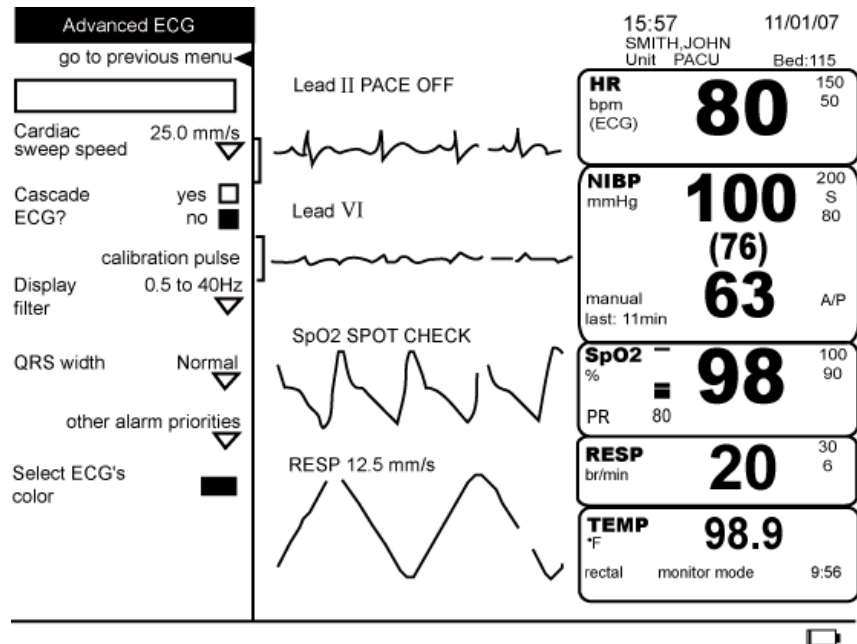
Re-learn

When you choose this option, the parameter will learn the new ECG pattern and correct the calculations of the HR/Pulse value. Use the **relearn** option whenever any dramatic change has occurred in the patient's ECG pattern and when ECG electrodes are changed or moved. The **LEARNING** message appears the first time a patient is connected to the ECG parameter, when the primary lead is changed, following long periods of excessive artifact, or when you choose the **Re-learn** option from the **Setup ECG** menu.

Label VA

This option is active in 5-electrode configuration. You can choose the label of **VA** lead from among **V1, V2, V3, V4, V5, V6** or **None**. The default label is **LEAD VA** and reverts to the default setting if discharging or admitting a patient.

Advanced settings



Cardiac sweep speed

You can use this option to set the sweep speed at **12.5 mm/s**, **25.0 mm/s**, or **50.0 mm/s**. The chosen sweep speed appears next to the lead label in the waveform field when it is a setting other than **25.0 mm/s**.

NOTES

- Changes you make to the sweep speed in this option will change the sweep speed of all cardiopulmonary waveforms.
- In the 5-electrode configuration module, if the sweep speed of the primary lead waveform has been fixed at 25.0mm/s in the **configuration mode**, the sweep speed of the primary lead waveform will remain at 25.0 mm/s regardless of changes to the sweep speed of the other cardiopulmonary waveforms.
- If the **Fixed ECG sweep speed** option (under the **Config setting** menu) is set to **yes**, the ECG **Cardiac sweep speed** menu option is not available.

Cascade ECG?

This option is active in 5-electrode configuration. This option lets you view double the number of seconds of data on the screen. When you choose **yes**, the primary waveform extends to an additional field below the original field.

NOTE: Mini trends window disables the cascading feature.

calibration pulse

When you push the Trim Knob to choose this option, one cycle of a ± 0.5 mV square wave appears in the primary waveform.

Display filter

This option sets the filtering level of high frequency noise interference. You can choose **0.05 to 100 Hz** for diagnostic mode, **0.05 to 40 Hz** for ST measurement mode, or **0.5 to 40 Hz** for routine monitoring mode. Choose the **0.5 to 40 Hz** filter setting to remove both low and high frequencies from the ECG waveforms. An example of low frequency interference is a baseline moving around on the display. An example of high frequency is AC power related interference, or rapidly changing signals making it difficult to distinguish clean QRS events in the ECG waveforms. The chosen filter appears next to the lead label in the waveform area when it is a setting other than **0.5 to 40 Hz**, which is the default setting.

QRS width

This option lets you adjust the ECG analysis setting for QRS Width. **Normal** is the default setting for adult and pediatric patients. A setting of **Normal** is used with ECG rhythms having QRS complex widths of 70 ms or wider. Alternately, you can choose the **Narrow** setting with patients having a QRS complex width less than 120 ms.

other alarm priorities

This option lets you choose priorities for **VTACH**, **Lead fail**, **Replace electrodes**, and **Artifact** alarms (**VTACH** is not available with the neonate setting.)

NOTE: In addition to crisis, warning, procedural and message, the priority of artifact can be set to **OFF**.

Select ECG's color

This option lets you choose the color of the parameter's vital signs on the Monitor screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Alarms

In both 3-electrode and 5-electrode configuration, an alarm message will appear in the waveform field next to the primary waveform lead label if the parameter detects a loss of all ECG waveforms. The alarm limits that may be associated with ECG are high and low HR/Pulse and high and low RESP. You can view or change these limits in two ways:

- Choose **adjust alarms** from the **Main Menu** and then choose **Choose autoset %** and **autoset all**

or

- Choose **HR/Pulse** or **RESP** from the **Setup parameters** option in the **Main Menu**. Then choose **adjust limits** from **Setup HR/Pulse** or **Setup RESP**.

Instructions for setting the HR/Pulse alarms are in the Heart Rate/Pulse section of this manual, and instructions for setting up the RESP alarms are in the RESP section. Additional information about alarms is in the Alarms section.

Calibration

The ECG parameter does not require calibration.

Auxiliary Output

The auxiliary output connector provides an analog ECG waveform output. The analog ECG waveform signal is a high level (1 V/mV) representation of the primary lead. To properly connect equipment to this output, please refer to the Appendix.

Specifications

Specifications	
Leads available	3-electrode configuration: I, II, III 5-electrode configuration: I, II, III, aVR, aVL, aVF, and VA
QRS amplitude range	0.5 to 5.0 mV
Heart rate accuracy	30 to 300 bpm ± 3 bpm or 3% of reading, whichever is greater
Heart rate resolution	1 bpm
Bandwidth	0.5 to 40 Hz +1/-6 dB 0.05 to 40 Hz +1/-6 dB 0.05 to 100 Hz +1/-6 dB
Standardizing voltage	1 mV marker
Common mode rejection	1 mV RTI or 10 mm p-p max displayed noise allowed with 20 Vrms, 50-60 Hz input
Input Impedance Common mode Differential	> 2.5 M Ω at 10 Hz > 2.5 M Ω from DC to 60 Hz
60 Hz tolerance	up to 10 mV
Pacemaker detection/rejection Input voltage range	± 2 mV to ± 700 mV

Specifications	
Tall T wave rejection	100% @ 0.05 to 40Hz or 0.05 to 100Hz 80% @ 0.5 to 40Hz
Lead off sensing current	< 0.1 μ A DC signal leads < 1 μ A DC driven lead
Time to alarm	high heart rate < 10 s per AAMI EC13 - 2002 low heart rate < 10 s per AAMI EC13 - 2002 cardiac standstill < 10 s per AAMI EC13 - 2002 tachycardia waveforms < 10 s per AAMI EC13 - 2002
ANSI/AAMI EC13-2002 Section 4.1.2.1 d). The Heart Rate Averaging computation is as follows, the average of the last 8 R-to-R intervals, the update rate of the Heart Rate on the display is once per second.	
When tested in accordance with ANSI/AAMI EC13-2002 Section 4.1.2.1f), the response time of the heart rate meter to changes in heart rate is:	
Step increase from 80 to 120 BPM Step decrease from 80 to 40 BPM	average 6.75 sec, range 6.5 to 7.3 sec average 10.04 sec, range 8 to 11 sec
When tested in accordance with ANSI/AAMI EC13-2002 Section 4.1.2.1g), the time to alarm for ventricular tachycardia is:	
For Figure 4a	averages range from 5 to 9 seconds with individual values ranging from 4 to 11 seconds.
For Figure 4b	averages range from 5 to 8 seconds with individual values ranging from 4 to 11 seconds
When tested in accordance with ANSI/AAMI EC13-2002 Section 4.1.4.3), the minimum input slew rate that will cause approximately 50% of the pulses to trigger the pacer pulse detector is:	
For Figure 5d	3.33 v/s RTI, +/- 10%
When tested in accordance with ANSI/AAMI EC13-2002 Section 4.1.2.1e), the heart rate after a 20 second stabilization period is:	
For figure 3a	1X size setting: not detect 2X size setting: 80 ± 3 bpm
For figure 3b	1X size setting: 30 ± 3 bpm 2X size setting: 60 ± 3 bpm
For figure 3c	1X size setting: 120 ± 3 bpm 2X size setting: 120 ± 3 bpm
For figure 3d	1X size setting: not detect 2X size setting: 90 ± 9 bpm

Poor Signal Troubleshooting

In general, a poor waveform indicates that the signal integrity is degraded because of “noise” in the waveform. The noise source could be generated by muscle interference due to patient movement, 60 (or 50) Hz interference, baseline “wandering,” saturation due to mechanical movement of one or more electrodes, or poor electrode connection.

Frequently, when the artifact is initially detected, the ECG parameter continues to report the last calculated heart rate. During this time, a visual message appears next to the primary lead label (in the same color as the primary waveform), and no alarm tone is heard.

If the artifact condition continues to be detected, the parameter becomes unable to calculate a heart rate due to the excessive “noise” in the signal. It then reports the heart rate as invalid (dashes). From this point on, the heart rate, as calculated by the ECG algorithm, remains invalid until the “noise” is sufficiently removed.

When the heart rate becomes invalid due to artifact, the ECG ARTIFACT alarm will be generated based upon its priority as set in the menu. When the priority is set to **OFF**, a visual message appears next to the primary lead label (in the same color as the primary waveform) and the alarm tone is not heard. When the priority is set to **message**, a visual alarm is issued (**ARTIFACT** message flashes red next to the lead label) and the alarm tone is heard. When the priority is set to **crisis**, **warning**, or **procedural**, a visual and audible alarm occurs. However, when the heart rate becomes invalid, if the priority setting is **message** or **OFF** and ECG is the only available source, the ECG ARTIFACT alarm will be generated as a **procedural** priority (visual and audible) alarm. This is done to inform the user that the patient’s heart rate cannot be monitored due to the excessive “noise.”

When the heart rate becomes invalid due to excessive noise being detected for prolonged periods, users should determine the cause of the artifact. Troubleshooting may help determine the type of interference present.

Muscle Interference

Muscle interference is generally intermittent and of short duration. If muscle artifact is continuous, the patient may be in distress or the electrodes may need to be reapplied at different sites. The best defense against muscle artifact interference is proper electrode placement, avoiding bony prominences and major muscle groups. Refer to the **Procedures** subhead for instruction on electrode site prep technique.

60 or 50 Hz Interference

Line-frequency interference (60 or 50 Hz), if present, is usually continuous (e.g., even if a waveform is present, HR may not appear in the presence of 60 Hz interference). It is best to attempt to find the source of the interference and remove it. To determine if there is line interference present in the signal, it may be necessary to change the **Display filter** option to **0.05 to 100 Hz**. Noise in the

waveform appears on the display as well as on recordings. Since line interference is continuous, it must either be removed or tolerated.

Sources of line interference include faulty lighting (especially fluorescent lights or ballasts), other equipment in the vicinity, or poor grounding. If line interference is present, verify that the electrode lead wires (especially with neonate cables and leads that have no shielding) are running close to each other. Braid the lead wires if possible. This often decreases the amount of interference.

While attempting to determine the source of the interference or if the interference cannot be removed, the ARTIFACT alarm can be silenced temporarily by pushing the silence button.

Baseline Wandering

Baseline wandering is generally intermittent but can also be continuous. The intermittent form is typically due to pushing on electrodes, pulling of lead wires, or poor electrode connection. The continuous form is primarily due to respiratory effort.

Baseline wandering may not be apparent on the display if **0.5 to 40 Hz** bandwidth is selected. To verify if baseline wandering is present, it may be necessary to set the **Display filter** option at **0.05 to 100 Hz**. Often, changing the selected primary lead or repositioning the electrodes eliminates continuous forms of baseline wander.

Saturation

Saturation is an intermittent condition due to mechanical movement of one or more electrodes or bad electrode connection. Saturation can last for up to 20 seconds from a single saturation event using a bandwidth of **0.05 to 100 Hz** or **0.05 to 40 Hz**. Multiple saturation events can generate longer periods of saturation. With a bandwidth of **0.5 to 40 Hz**, the signal may appear to be back in the center, but an artifact message continues to be displayed until the **0.05 to 100 Hz** signal actually returns to the center for longer than 2 seconds.

If the saturation of the signal causes the waveform to move between the top and bottom of the display and the waveform does not stay in the middle of the display long enough, then the clinician should change the primary lead or decrease ECG waveform size. If saturation of the signal is continuously at the top or continuously at the bottom for extended periods of time, electrode contact should be checked or replaced.

Poor Electrode Connections

Poor electrode connection can be the cause for any form of ECG interference. The clinician should check and replace lead wires or electrodes as necessary. When applying electrodes, prep the area as recommended under subhead **Procedures** earlier in this section.

Most clinical applications use the default of **0.5 to 40 Hz** for the **Display filter** setting. The diagnostic mode (**0.05 to 100 Hz**) is mainly used for observing ST

level changes, or to troubleshoot the cause of artifact, especially the presence of line interference. If a user is getting an artifact message and the display looks clean with the **Display filter** option set at **0.5 to 40 Hz**, turning on the diagnostic mode bandwidth can make visible the artifact present in the waveform.

Alarms

ECG Alarms		
Name of Alarm	Probable Cause	Response
Lead Fail	no lead is available from which to derive HR	message appears in waveform and alarm message field; HR/Pulse value is forced to dashes if it's the only source
ECG Artifact	• muscle (motion) artifact • 60 Hz, high frequency noise • baseline wander	when first detected, message appears in waveform area; if condition continues, HR/Pulse value is forced to dashes if it's the only source, and this alarm is re-issued based upon its priority (if its priority is set for OFF it is re-issued at procedural priority)
Replace Electrodes	• ECG lead polarization (saturation) from electrodes being left on patient over recommended 48 hours • defibrillation (monitor will recover after defibrillation)	message appears in waveform area message appears in alarm message field
VTACH Lethal Arrhythmia Enabled	• ADULT/PEDIATRIC: a number of ventricular beats are detected • NEONATE: not available	message appears in waveform area. heart rate indicator flashes
VFIB/VTACH Lethal Arrhythmia Enabled	an ECG waveform is detected that is indicating a chaotic ventricular rhythm	message appears in waveform area message appears in alarm message field audible alarm sounds
ASYSTOLE Lethal Arrhythmia Enabled	ventricular asystole occurs whenever the displayed Heart Rate drops to zero.	message appears in waveform area message appears in alarm message field audible alarm sounds

10 RESP

Procedure Checklist

1. Make sure electrodes are positioned properly.
2. Select **RESP** from the **Setup parameters** option in the **Main Menu**.
3. Set up monitoring parameters.

Description

Respirations are monitored in the Dash 2500 Patient Monitor by the RESP parameter. Respiration rate using the ECG electrodes is designated RESP. As long as patient data is being collected and analyzed by the ECG parameter, and the RESP parameter is not off-line, a respiration rate value appears in the vital signs area of the screen.

Respiration monitoring is accomplished by measuring the thoracic impedance between two electrodes. As the patient breathes, the movement of the chest changes the impedance, and the differences produce the respiration rate in the RESP vital signs area of the screen.

Respiration rate (RESP) automatically appears when the ECG parameter can display waveforms for lead I, II or III, and the **Turn on RESP with ECG?** option under the **config resp** menu is turned on. If the **Turn on RESP with ECG?** option is turned off, RESP does not appear until it is selected from the **Setup parameters** option in the **Main Menu**.

Audible and visible alarms warn you when the respiration rate is outside the selected high or low limit.

Indications and Contraindications

The Dash 2500 Patient Monitor, when used with appropriate parameters, is indicated for monitoring respiration rate. This device is not designed, sold, or intended for use as an apnea monitor.

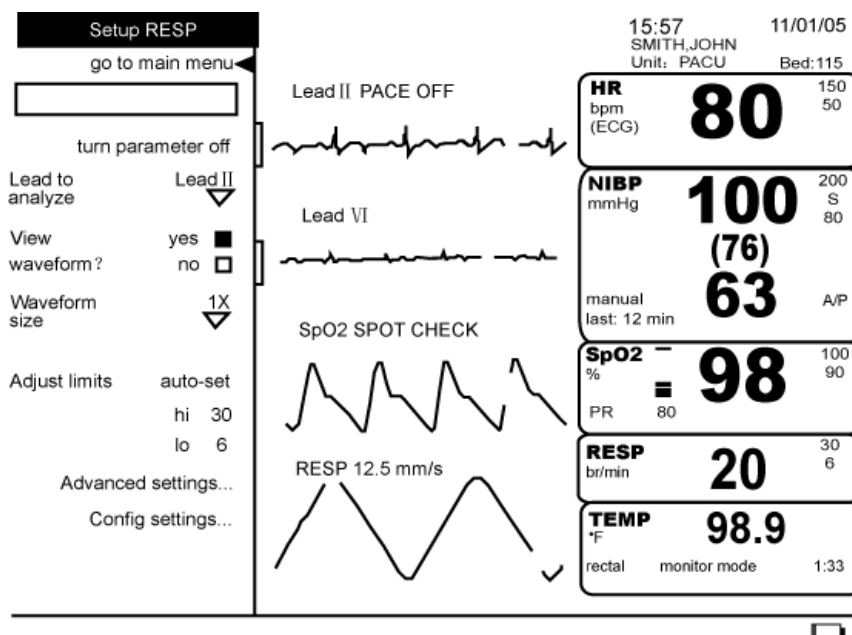
WARNING

Certain artifact conditions and some pacemakers can cause inaccurate detection of impedance respirations. Pacemakers may cause sufficient artifact to trigger false detection of respiration. Always observe pacemaker patients closely.

Procedures

1. If you intend to use the ECG electrodes as the source of respiration rate, make sure that the electrodes are positioned properly for measuring impedance respiration. Refer to "Electrode Placement Site" in the ECG section for correct positioning.
2. Choose **RESP** from the **Setup parameters** option in the **Main Menu**, and set up the desired monitoring parameters.

RESP Menu



turn parameter off

This option lets you suspend all monitoring and alarms for RESP. When you choose this option, no vital sign area is allocated to RESP, and the message **offline-RESP** appears in the **setup parameters** option. To resume monitoring, choose **offline-RESP** from the **setup parameters** option.

Lead to analyze

This option lets you choose whether the impedance RESP will be derived from Lead I or Lead II.

View waveform?

You can use this option to choose whether or not the impedance respiration waveform appears on the screen.

Waveform size

This option lets you change the height of the respiratory waveform to one fourth, one half, one, two, four, or eight times the standard height. The selections are **X/4**, **X/2**, **1X**, **2X**, **4X**, and **8X**. The chosen waveform size appears next to the RESP label in the waveform area when it is a setting other than **1X**.

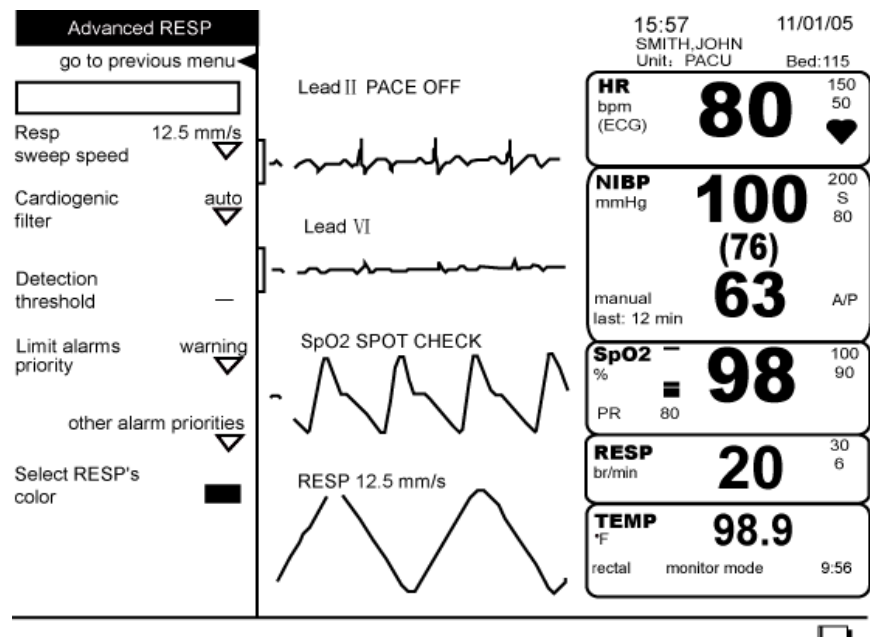
Adjust limits

The adjustable and auto-set alarm limits are shown in the table. Choose **hi** to change the high alarm limit and **lo** to change the low alarm limit. The system maintains appropriate separation between the high and low limits. Choose **auto-set** to use the patient's current values in setting the high and low limits.

NOTE: When Adjust Limits option is set to **auto-set**, RESP value is reduced each second until the RESP limit alarm is reached.

RESP Rate Alarm Limits				
Respiration Rate	Adjustable		Auto-set choice: 20%, 30%, 40%	
	Low	High	Low	High
Adult/Pediatric	6-115 (bpm)	11-120 (bpm)	current reading minus chosen percentage	current reading plus chosen percentage
Neonate	6-175 (bpm)	11-180 (bpm)	current reading minus chosen percentage	current reading plus chosen percentage

Advanced settings



RESP sweep speed

This option, which appears in all menus associated with respiratory waveforms, lets you change the speed of all respiratory waveforms to **6.25 mm/s**, **12.5 mm/s**, or **25.0 mm/s**. The chosen sweep speed appears next to the RESP label in the waveform area.

Cardiogenic filter

This option activates and deactivates the cardiogenic filter and lets you decide how the breath detection threshold is determined. When you choose **auto**, the Monitor uses heart rate derived from the ECG parameter and automatically sets the breath detection threshold. When you choose **manual**, the cardiogenic filter is deactivated causing the Monitor not to use the ECG rate output to monitor RESP. You can then manually set the breath detection threshold using the **Detection threshold** option.

Detection threshold

This option is accessible only when the cardiogenic filter is set to **manual**. When you choose this option, a horizontal line appears on the impedance waveform and a number representing the current detection threshold appears next to the menu option. The number is the position of the line as a percentage of the displayed waveform. Turning the Trim Knob moves the line up and down and changes the number in the box. You must push the Trim Knob to set the detection threshold. The horizontal line then disappears from the waveform. A new breath is counted each time the measured impedance goes above and then below the detection threshold.

Limit alarms priority

This option lets you choose the priority of the limit alarms.

other alarm priorities

This option lets you choose priorities for **Resp approaching**, **Lead fail**, **Saturation**, and **Artifact** alarms.

NOTE: When in manual mode, the **Resp approaching** alarm compares the most recent heart rate interval to the most recent breath interval. The alarm is activated if the breath interval is within (approximately) $\pm 10\%$ of the heart rate interval.

Select RESP's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor's screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Specifications

Specifications	
ECG-Derived Respiration Rate	
Leads available	I or II
Range	6 to 120 breaths/min (adult/pediatric) 6 to 180 breaths/min (neonate)
Accuracy	± 2 breaths/min or $\pm 3\%$ of reading; whichever is greater
Resolution	1 breath/min
Base Impedance	100 to 2000 Ω
Detection Sensitivity	0.2 Ω @ 30 breath/min with 500 Ω baseline impedance
Excitation Frequency	65.5 kHz
Amplitude	< 300 μA rms

Alarms

Respiration Alarms		
Name of Alarm	Cause	Response
Resp High	value is greater than "hi" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field
Resp Low	value is less than "lo" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field
Resp Lead Fail	electrode unattached or improperly attached	message appears in waveform and alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes
Resp Baseline Saturation	signal is not valid due to excessive noise or an electrode problem	message appears in waveform and alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes
Resp Rate Approaching HR	patient's RESP rate is approaching the heart rate	message appears in waveform and alarm message field; parameter label flashes in vital signs field
Resp Artifact	invalid signal due to excessive noise (patient movement or loose electrode)	message appears in waveform and alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes

11 NIBP

Procedure Checklist

1. Connect hose to NIBP connector on side of Monitor.
2. Measure patient's limb and select properly sized cuff.
3. Connect cuff to hose.
4. Squeeze air from cuff.
5. Place cuff on patient.
6. Manual mode: push the **NIBP Go/Stop** hardkey once to obtain immediate determination.
7. Select **NIBP** from the **Setup parameters** option in **Main Menu** to set or change limits or to set up auto mode.
8. Auto mode: quick-push the **NIBP Auto** hardkey to begin auto BP determinations.
9. Stat mode: push-and-hold the **NIBP Auto** hardkey to obtain continuous determinations for 5 minutes.

Description

Blood pressure is monitored noninvasively in the Dash 2500 Patient Monitor by a noninvasive blood pressure (NIBP) parameter that uses the oscillometric method of measurement. The oscillometric method measures the amplitude of the pressure oscillations within the blood pressure cuff. Further information about the oscillometric method is listed under Principles of Noninvasive Blood Pressure Determination.

Systolic pressure, diastolic pressure, mean arterial pressure, and cuff pressure are displayed in the NIBP vital signs area. The time elapsed since the last determination appears in the NIBP field for a period of 120 minutes. After 120 minutes, the NIBP value appears as dashes. Pulse rate derived from NIBP may be displayed in the HR field. Directions for obtaining the pulse rate from NIBP are in the HR/Pulse section of this manual.

The NIBP parameter has three operating modes: manual, auto (and custom auto), and stat. The selected mode is shown on the screen. In manual mode, which you access by pushing the **NIBP Go/Stop** hardkey, the NIBP parameter determines the blood pressure one time. In auto mode, which you access from the Setup NIBP menu or by quick-pushing the **NIBP Auto** hardkey, the NIBP parameter determines the blood pressure at specified time intervals from 1 to 120 minutes. In custom auto mode, which you access from the **Setup NIBP** menu, the NIBP parameter determines the blood pressure at user-specified time intervals that best suit your clinical situation. In stat mode, which you access by push-and-holding the **NIBP Auto** hardkey until a confirmation tone sounds, the NIBP parameter determines the blood pressure as many times as possible in 5 minutes.

The NIBP algorithm is optimized for two different patient populations: Adult/Pediatric patients and Neonate patients, and it operates very differently for each. To allow for varying hose lengths in the future, the algorithm no longer automatically bases the type of determination it performs on the length of the hose. The cuff or hose type, and therefore the type of determination performed, now follows the patient type of the Monitor as displayed in the upper left hand corner of the screen (when the menu is closed) or in the **Choose patient settings** menu option in the **Admit patient** menu.

Audible and visible alarms warn you when a value for systolic pressure, diastolic pressure, mean arterial pressure, or pulse rate (when NIBP is the source) is outside the selected high or low limit.

Indications and Contraindications

The NIBP parameter is indicated for use in noninvasive monitoring of blood pressure and pulse rate as a component of the Dash 2500 Patient Monitor. This device is not designed, sold, or intended for use except as indicated.

WARNINGS

The NIBP parameter will not measure blood pressure effectively on patients who are experiencing seizures or tremors.

Arrhythmias will increase the time required by the NIBP parameter to determine a blood pressure and may extend the time beyond the capabilities of the parameter (120 seconds for adult/pediatric and 85 seconds for neonate).

The Dash 2500 Patient Monitor displays the results of the last blood pressure determination for 120 minutes or until another determination is completed. If a patient's condition changes between one determination and the next, the NIBP parameter may not detect the change or indicate an alarm condition.

Devices that exert pressure on tissue have been associated with purpura, skin avulsion, compartmental syndrome, ischemia, and/or neuropathy. To minimize these potential problems, especially when monitoring at frequent intervals or over extended periods of time, make sure the cuff is applied appropriately and examine the cuff site and the limb distal to the cuff regularly for signs of impeded blood flow.

Do not apply external pressure against cuff while monitoring. Doing so may cause inaccurate blood pressure values.

Use care when placing cuff on extremity used to monitor other patient parameters.

Use only accessories recommended by GE Medical Systems *Information Technologies*. Failure to use recommended accessories may result in inaccurate readings.

Blood pressure cuffs should be removed from the patient when the Monitor is powered off. If the extremity remains cuffed under these conditions or if the interval between blood pressure determinations is prolonged, the patient's limb should be observed frequently and the cuff placement site should be rotated as needed.

In patients with irregular rhythm, wait 3 minutes after ECG has been connected and ECG heart rate is present on the monitor screen before performing an NIBP determination.

CAUTION

The pulse rate derived from an NIBP determination may differ from the heart rate derived from an ECG waveform because the NIBP parameter measures actual peripheral pulses, not electrical signals or contractions from the heart. Differences may occur because electrical signals at the heart occasionally fail to produce a peripheral pulse or the patient may have poor peripheral perfusion. Also, if a patient's beat-to-beat pulse amplitude varies significantly (e.g., because of pulsus alternans, atrial fibrillation, or the use of a rapid-cycling artificial ventilator), blood pressure and pulse rate readings can be erratic, and an alternate measuring method should be used for confirmation.

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease heart rate.
- Because treatment protocols based on the patient's blood pressure may rely on specific values and differing measurement methods, such as auscultatory, clinicians should note a possible variance from values obtained with the Dash 2500 Patient Monitor in planning patient care management.
- NIBP values in the Dash 2500 Patient Monitor are based on the oscillometric method of noninvasive blood pressure measurement taken with a cuff on the arms of Adults/Pediatrics and a cuff on the calf of the neonates and correspond to comparisons with intra-arterial values within ANSI/AAMI SP10 Standards for accuracy (a mean difference of ± 5 mmHg, and a standard deviation of ≤ 8 mmHg).
- This equipment is suitable for use in the presence of electrosurgery.

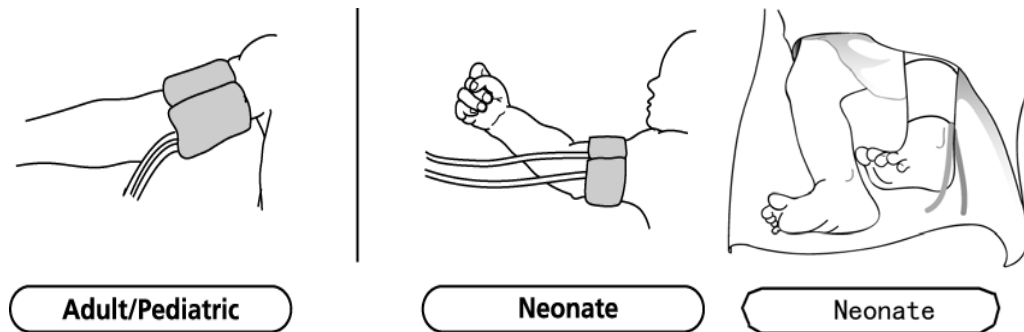
Procedures

1. Connect the air hose to the NIBP port on the side of the Monitor. Make sure that the hose is not kinked or compressed.
2. Verify that the Monitor's patient type and cuff type match and are set properly.

WARNING

Cuff type and cuff size must be correct to for the NIBP algorithm to function properly and to prevent overpressure in neonatal use.

3. Choose the appropriate blood pressure measurement site. In Adult/ Pediatric, because normative values are generally based on this site and as a matter of convenience, the upper arm is preferred. When upper arm size or shape or the patient's clinical condition or other factors prohibit use of the upper arm, the clinician must plan patient care accordingly, taking into account the patient's cardiovascular status and the effect of an alternative site on blood pressure values, proper cuff size and comfort. The figure shows the recommended sites for placing cuffs.



Recommended Cuff Placement

WARNING

Do not place the cuff on a limb being used for intravenous infusion or any area where circulation is compromised or has the potential to be compromised.

4. If patient is standing, sitting, or inclined ensure that cuffed limb is supported to maintain cuff at level of patient's heart. If cuff is not at heart level, the difference in systolic and diastolic values due to hydrostatic effect must be considered. Add 1.80 mmHg to values for every inch (2.54 cm) above heart level. Subtract 1.80 mmHg from values for every inch (2.54 cm) below heart level.
5. Choose appropriate cuff size. Measure patient's limb and choose appropriately sized cuff according to size marked on cuff or cuff packaging. When cuff sizes overlap for a specified circumference, choose the larger size cuff.

CAUTION

Precaution: Accuracy depends on use of proper size cuff.

6. Inspect cuff for damage. Replace cuff when aging, tearing or weak closure is apparent. Do not inflate cuff when unwrapped.

CAUTION

Do not use cuff if structural integrity is suspect.

7. Connect the cuff to the air hose.

WARNING

It is mandatory that the appropriate hose and cuff combination be used.

8. Inspect patient's limb prior to application.

CAUTION

Do not apply cuff to areas where skin is not intact or tissue is injured.

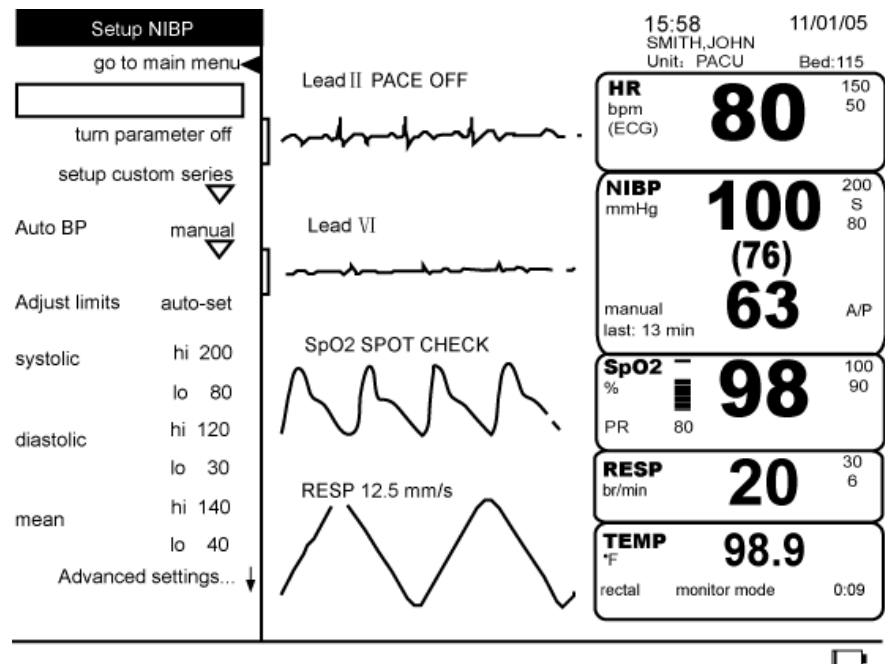
9. Palpate artery and place cuff so that patient's artery is aligned with cuff arrow marked "artery."
10. Squeeze all air from cuff and confirm that connection is secure and unoccluded and that tubing is not kinked.
11. Wrap cuff snugly around the patient's limb. Cuff index line must fall within range markings. Ensure that hook and loop closures are properly engaged so that pressure is evenly distributed throughout cuff. If upper arm is used, place cuff as far proximally as possible.
12. Proper cuff wrapping should be snug, but should still allow space for a finger between patient and cuff. Cuff should not be so tight as to prevent venous return between determinations.

WARNING

Using a cuff that is too tight will cause venous congestion and discoloration of the limb, but using a cuff that is too loose may result in no readings and/or inaccurate readings.

13. Choose **NIBP** from the **Setup parameters** option in the **Main Menu**, and set up the desired monitoring parameters.
14. The Monitor beeps once to signal the completion of the determination and values are posted in the vital signs area.

NIBP Menu



turn parameter off

This menu option enables you to suspend all monitoring and alarms for NIBP. When you choose this option, no vital sign area is allocated to NIBP and the message **offline-NIBP** appears in the **setup parameters** option. To resume monitoring, choose **offline-NIBP** from the **setup parameters** option or push the **NIBP Go/Stop** or **NIBP Auto** hardkey.

setup custom series

This option lets you configure a custom auto mode to meet the needs of your clinical situation. Within this option, you can configure up to four separate steps for auto BP determinations by setting the BP time interval and how many times this interval is repeated. BP times can be set to **OFF** or to cycle at intervals of **1 min** to **120 min**. The **Repeat** option can be set to **OFF** or **cont** (which continues, or repeats, this step indefinitely) or to **1** to **25** times. For example, if your clinical situation calls for a stair stepping of NIBP determinations, you might configure your custom setup as follows.

1st BP series	q5min
repeat	x3
2nd BP series	q15min
repeat	x3
3rd BP series	q30min
repeat	x3
4th BP series	q60min
repeat	x3

After configuring your custom steps, choose **start custom** to begin your custom auto BP mode determinations. **Custom** now appears next to the **Auto BP** option and an elliptic circle appears in the NIBP vitals signs area indicating custom auto BP mode. If you switch NIBP modes and then wish to resume to your custom auto BP mode, choose the **custom** selection from the **Auto BP** menu option. Once chosen, the **start custom** menu option changes to the **stop custom** option. To cancel the custom mode, choose **stop custom** from the **setup custom series** menu. To stop a single custom determination, push the **NIBP Go/Stop** hardkey. As the Monitor completes each step, the completed step turns green and becomes unselectable (in the menu options).

Auto BP

This option lets you set time-cycled (auto mode) NIBP determinations. Measurements will occur at intervals of **1 min, 2 min, 3 min, 4 min, 5 min, 10 min, 15 min, 20 min, 30 min, 60 min, 90 min, or 120 minutes**. You can choose **manual** to return to manual determinations. Or, you can also choose **custom** to activate the user-defined auto mode (to configure **custom** selection, choose **setup custom series**). In auto mode, determinations are synchronized with the system clock giving the user the convenience of having the readings fall on every quarter-hour, half-hour, and hour, etc., depending upon the time interval setting. For example, if the current time was 8:07 and **15 min** is chosen for the **Auto BP** option, after the first auto determination, other auto determinations would be started at 8:15, 8:30, 8:45, 9:00. The only time interval not synched to the clock is **1 min**. If you choose **120 min**, the auto determinations fall every numbered hours: 12:00, 2:00, 4:00, etc.

NOTES

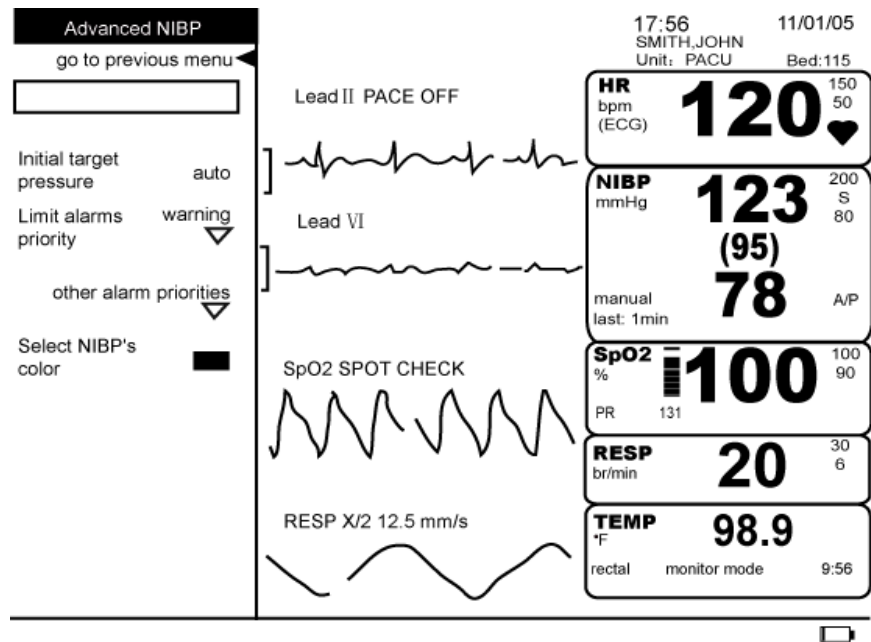
- To cancel the determination in progress, push the **NIBP Go/Stop** hardkey. To cancel auto mode, choose **manual**.
- The **custom** menu option is not selectable if a custom determination is active or if no steps have been configured; however, you can still open the **Auto BP** extended menu.
- Because determinations are synchronized with the system clock, you may receive one extra determination when in auto mode.

Adjust limits

The adjustable and auto-set alarm limits are shown in the table. Choose **hi** to change the high alarm limit and **lo** to change the low alarm limit. You can set high and low limits individually for systolic, diastolic, and mean values. The system maintains appropriate separation between the high and low limits. Choose **auto-set** to use the patient's current readings in setting the high and low limits.

NIBP Alarm Limits (mmHg)						
	Patient	Adjustable		Auto-set choices: 20%, 30%, or 40%		
		Low	High	mmHg	Low	High
Systolic	adult/ pediatric	30 - 285	35 - 290	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5
	neonatal	30 - 135	35 - 140	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5
Mean	adult/ pediatric	20 - 255	25 - 260	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5
	neonatal	20 - 120	25 - 125	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5
Diastolic	adult/ pediatric	10 - 215	15 - 220	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5
	neonatal	10 - 105	15 - 110	> 25	current reading minus chosen percentage	current reading plus chosen percentage
				≤ 25	current reading minus 5	current reading minus 5

Advanced settings



Initial target pressure

This option lets you choose the initial pressure for the next cuff inflation. If previous NIBP values are still “remembered” by the NIBP algorithm, these values are used to determine the next pump-up target pressure. The NIBP algorithm will remember target inflation pressure for only 16 minutes in Manual mode and 120 minutes in Auto mode. The NIBP determination results can be displayed for up to 120 minutes in Manual and Auto modes. For adult/pediatric patients, adjust the pressure between 100 to 250 mmHg (in increments of 5). For neonate patients, adjust between 100 to 140 mmHg (in increments of 5). An **auto** selection is also available, which uses the target pressure defaults of the NIBP parameter. These defaults are based on patient type and the parameter’s algorithm for determining blood pressure.

NOTE: Selecting a target pressure will clear old NIBP values in the vital signs area.

Limit alarms priority

This option lets you choose the priority of the limit alarms.

other alarm priorities

This option lets you choose priorities for **No determination**, **Over-pressure**, **Pump timeout**, **Total timeout**, and **Level timeout** alarms.

Select NIBP's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor's screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

NIBP Hardkeys

NIBP Go/Stop Hardkey



The **NIBP Go/Stop** hardkey initiates a noninvasive blood pressure determination. If the **NIBP Go/Stop** hardkey is active, pushing the hardkey again cancels the determination. If the **NIBP Go/Stop** hardkey is pushed while in an auto mode determination, only the determination in progress is canceled; NIBP remains in auto or custom mode. If the **NIBP Go/Stop** hardkey is pushed while in stat mode, both the mode and the determination are canceled.

NOTES

- The **NIBP Go/Stop** hardkey is unavailable if an **OVERPRESSURE** alarm is active.
- The first push of the **NIBP Go/Stop** hardkey after the Monitor is first turned on and while NIBP is still offline prompts the user with a dialog box saying **CAUTION! Cannot detect cuff type automatically! Please choose cuff type**. Selections are **Adult/Pediatric** and **Neonate**. Upon confirmation of one of these, a determination will start.

NIBP Auto Hardkey



The **NIBP Auto** hardkey initiates auto and stat determinations and opens the **Auto BP** menu option for quick access to set the auto cycle time.

The time between auto-BP determinations is user-selected (1-, 2-, 3-, 4-, 5-, 10-, 15-, 20-, 30-, 60-, 90-, and 120-minute intervals). You can also choose manual to return to manual determinations or custom to activate the user-defined auto mode.

NOTES

- The **NIBP Auto** hardkey is unavailable if an **OVERPRESSURE** alarm is active.
- The single-push function of this hardkey is unavailable if: 1) the freeze feature is active or 2) an adjuster menu is open.
- During a **stat** determination, the Monitor will sound a tone and display the early systolic pressure. The early systolic value will disappear once the blood pressure determination is complete. Early systolic is not shown for the first stat determination.
- If the unit is on battery operation and battery life is at or below 15%, **stat** determinations will not be enabled. However, current determinations will be completed if underway at the time of the **BATTERY LOW** alarm.

Auto Mode

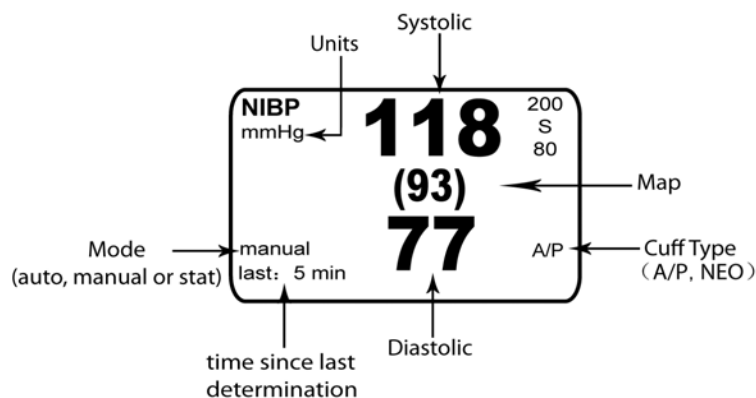
Auto mode determinations are started automatically when a time interval is selected in the **Auto BP** menu option or when the **NIBP Auto** hardkey is quick-pushed. If a manual determination is in progress, it is considered to be the first of the auto mode determinations. If stat mode is active, auto mode starts when the stat determinations are complete. In auto mode, determinations are synchronized with the system clock giving the user the convenience of having the readings fall on every quarter-hour, half-hour, and hour, etc., depending upon the time interval setting. For example, if the current time was 8:07 and **15 min** is chosen for **Auto BP**, after the first auto determination, other auto determinations would be started at 8:15, 8:30, 8:45, 9:00, etc. Warning:

WARNING

The NIBP parameter should be set to determine blood pressures only as frequently as is clinically necessary to ensure adequate patient monitoring.

- To start the series of auto NIBP determinations, choose a time interval. The first determination starts, and **auto: XX min** (the time you have selected) appears in the vital signs field. Subsequent determinations will start automatically at the specified time interval.

- To cancel the auto mode, choose **manual**; determinations are no longer automatically started. Any determination in progress is completed.
- To start an NIBP determination between scheduled auto determination times, push the **NIBP Go/Stop** hardkey. The cycle time counter is not reset due to the completion of a manual determination.
- To stop an auto determination that is in progress, push the **NIBP Go/Stop** hardkey. The cuff will deflate.
- If a patient alarm occurs during the first auto determination, another auto determination will start in order to verify the alarm.
- If an **NIBP NO DETERMINATION** alarm occurs, a repeat determination will start in order to verify the alarm. A subsequent auto mode determination is attempted at the next scheduled interval, however, a repeat determination to verify this alarm will not again be attempted until a determination results in valid values. Pushing the **NIBP Go/Stop** hardkey just prior to or during a repeat determination to verify an alarm, cancels that determination.



Manual Mode

You can start a single NIBP determination at any time by pushing the **NIBP Go/Stop** hardkey.

NOTE: Because the **NIBP Go/Stop** hardkey is an on-off switch, you can cancel a manual, auto, custom, or stat NIBP determination in progress at any time by pushing this key.

Stat Mode

Stat mode starts 5 minutes of continuous NIBP determinations. Upon initiation of stat mode, the **NIBP** and **stat** labels in the vital signs area blink yellow. Once either the systolic or MAP derived vital sign is updated with a new value (including early systolic), all three vital signs turn yellow and blink. These vital signs remain yellow and blinking until stat mode is terminated.

You can take multiple NIBP readings at any time by push-and-holding the **NIBP Auto** hardkey until you hear a confirmation tone. Stat mode takes precedence over all other NIBP modes. If you push-and-hold the **NIBP Auto** hardkey when a manual determination is not in progress, a 5-minute series of determinations

starts. If you push-and-hold the **NIBP Auto** hardkey when a manual determination is in progress, that determination becomes the first in the series. If you push the **NIBP Go/Stop** hardkey during a series of stat determinations, you will cancel the determination in progress and the rest of the series. At the end of stat mode, the Monitor reverts to the NIBP mode it was in prior to the start of stat mode.

The series begins with cuff inflation to a pressure above previous systolic value or, if no previous systolic is stored, to the configured initial target inflation pressure. The initial target pressure selection for neonates has a maximum pressure of 140 mmHg. Artifact rejection is relaxed in stat mode for adult/pediatric patients to allow for accelerated determinations. During stat determinations, systolic, diastolic, mean, and pulse rate values will not be checked against their limits. An "early" systolic appears in the NIBP field when possible. When mean or MAP, pulse, and diastolic pressure values are determined, the Dash 2500 Patient Monitor sounds a short tone and the updated values appear. Another determination begins once the pressure falls below 5 mmHg for 8 seconds for neonates or below 15 mmHg for 4 seconds for adults, unless the 5-minute period has ended, or you have pushed the **NIBP Go/Stop** hardkey.

NOTE: During stat mode, all NIBP limit alarms are suppressed both during and at the end of the 5 minutes of determinations.

Service

Calibration of the parameter should be checked every 12 months or when there is doubt about the validity of the noninvasive blood pressure readings. Calibration should be performed by a qualified service person.

A leak test of the parameter should be performed every 12 months or when there is doubt about the validity of the pressure readings.

CAUTION

Refer calibration and leak testing to qualified service personnel. Full calibration details are available in the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001), available from GE Medical Systems *Information Technologies*.

Cuff Cleaning and Disinfection

General

- The cuff must be thoroughly cleaned with the specified detergent before reuse. The additional use of household bleach as described below provides at least intermediate-level disinfection.
- Apply cuff hose plugs before cleaning.

- The following cleansing procedure was repeated 20 times on DURA-CUF[®] Blood Pressure Cuffs and once on SOFT-CUF[®] Blood Pressure Cuffs without affecting the performance of the cuff.
- While this procedure is adequate for cleaning/disinfection, it may not remove all stains.
- Do **not** immerse hoses.
- Do **not** immerse cuffs without prior application of cuff hose caps.

Materials

- Enzymatic detergent such as ENZOL[®] enzymatic detergent (US) or Cidezyme[®] enzymatic detergent (UK)
- Distilled water
- 10% solution of household bleach (5.25% sodium hypochlorite) in distilled water
- Soft cloths and soft-bristled brushes
- Spray bottles

Procedure

1. Prepare the enzymatic detergent according to the manufacturer's instructions and the 10% bleach solution, in separate spray bottles.
2. Spray the detergent liberally on device. If the material is dried on, allow the cuff to sit for 1 minute. For soil on the soft part of the closure or the cuff itself, wipe the material off with a soft cloth. For persistent contamination on the soft part of the closure, use a soft-bristled brush to loosen particles. Rinse with copious amounts of distilled water. Repeat until no visible contamination remains. For soil on the hook part of the closure, use a soft-bristled brush to remove the material, and rinse with copious amounts of distilled water. Repeat until no visible contamination remains.
3. Spray the 10% bleach solution on the affected area until the area is saturated. Allow the cuff to sit for 5 minutes.
4. Wipe away any excess solution and rinse the cuff again with distilled water. Allow 2 hours for drying.

The user has the responsibility to validate any deviations from the recommended method of cleaning and disinfection.

NOTE: For additional information on infection control procedures, contact GE Medical Systems *Information Technologies* Technical Support.

Specifications

Specifications	
Method	Oscillometric with step deflation
Modes	Manual, automatic, stat
BP Measurement Ranges	
Systolic	30 to 290 mmHg (adult/pediatric) 4.0 to 38.7 kPa (adult/pediatric) 30 to 140 mmHg (neonate) 4.0 to 18.7 kPa (neonate)
MAP	20 to 260 mmHg (adult/pediatric) 2.7 to 34.7 kPa (adult/pediatric) 20 to 125 mmHg (neonate) 2.7 to 16.7 kPa (neonate)
Diastolic	10 to 220 mmHg (adult/pediatric) 1.3 to 29.3 kPa (adult/pediatric) 10 to 110 mmHg (neonate) 1.3 to 14.7 kPa (neonate)
Resolution	1 mmHg
Accuracy	Meets AAMI/ANSI standard SP10:1992
Initial Cuff Inflation Pressure	135 ± 15 mmHg default; user selectable (adult/pediatric) 100 ± 15 mmHg default; user selectable (neonate)
Maximum Determination Time	120 s (adult/pediatric) 85 s (neonate)
Over Pressure Monitor	300 to 330 mmHg (adult/pediatric) 150 to 165 mmHg (neonate)
Pulse Rate	When NIBP is the source, HR values are derived from the pulse rate that is determined by the oscillometric technique of measuring blood pressure. The rate source field is labeled NIBP. Adult/Pediatric Range: 30 to 200 bpm (± 3.5% or 3 bpm) Neonate Range: 30 to 220 bpm (± 3.5% or 3 bpm)

GE Healthcare Patents

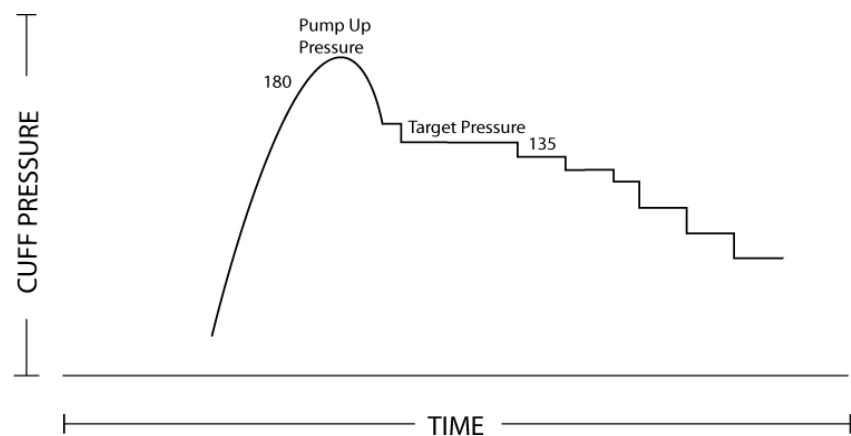
4,638,810; 5,052,397; 4,754,761; 5,170,795; 6,188,407; 5,357,970; 5,704,362; 5,680,870; 5,518,000; 6,893,403; 6,423,010; 6,358,213; 5,704,362; 5,579,776 and international equivalents. US patents pending.

Principles of SuperSTAT Noninvasive Blood Pressure Determination

The oscillometric method of determining NIBP is accomplished by a sensitive transducer which measures cuff pressure and pressure oscillations within the cuff. For the first determination taken on a patient, the algorithm stores the pattern of the patient's oscillation size as a function of the pressure steps. For subsequent manual (determined as such when the previous determination is less than 16 minutes old), auto or stat determinations taken of the same patient, as few as four pressure steps may be necessary to complete the determination process. When employing fewer pressure steps, the system uses the stored information from the previous blood pressure determination to decide the best pressure steps to take. The algorithm measures the consistency of pulse size to tell if the oscillations taken at a step are good and if more steps are needed.

The first determination settles at an initial target pressure of 135 mmHg (adult mode) and 100 mmHg (neonate mode), depending on initial target pressure preset. To allow for rapid settling of cuff pressure, the monitor will momentarily inflate to a higher pressure then immediately deflate to the target pressure. After inflating the cuff, the NIBP parameter begins to deflate. The oscillations versus cuff pressure are measured to determine the mean pressure and calculate the systolic and diastolic pressures.

During an NIBP determination, the parameter deflates the cuff one step each time it detects two pulsations of relatively equal amplitude. The time between deflation steps depends on the frequency of these matched pulses (pulse rate of the patient). However, if the monitor is unable to find any pulse within several seconds, it will deflate to the next step. The process of finding two matched pulses at each step provides artifact rejection due to patient movement and greatly enhances the accuracy of the monitor. The figure shows a full determination sequence for an adult patient. In stat mode, some steps may require only one pulse.

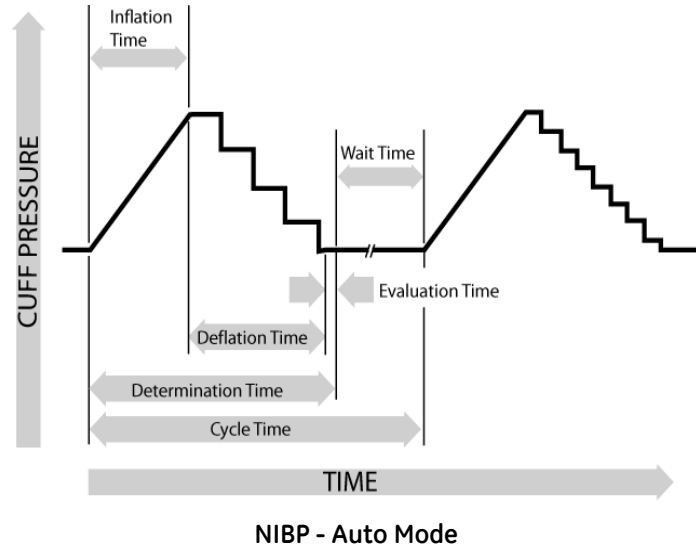


Full NIBP Determination Sequence for Adult

At each step the microprocessor stores cuff pressure, the matched pulse amplitude, and the time between successive pulses. The stepped deflation and matched pulse detection continues until diastolic pressure is determined or total

cuff pressure falls below 8 mmHg. The parameter then deflates the cuff (to zero detected pressure), analyzes the stored data, and updates the screen.

The operating cycle is composed of four parts: inflation time, deflation time, evaluation time, and wait time. Wait time, which varies from mode to mode, is affected by the cycle time (auto mode) or operator intervention (manual mode). The figure shows the basic operating cycle for an NIBP determination.



Systolic Search

If systolic pressure is not found, the NIBP parameter can search at cuff pressures higher than the initial target pressure. The parameter will inflate the cuff above the initial target pressure to get better data in the systolic region. The maximum pressure allowed in systolic search is limited by the normal range for cuff pressures.

In any operating mode, if a patient's systolic pressure exceeds the inflation pressure, the parameter will begin normal deflation sequence, detect the absence of a systolic value, stop deflation, reinflate to a higher (than initial) inflation pressure (290 mmHg maximum in adult mode; 145mmHg in neonatal mode), and resume the normal deflation sequence.

If it has been 16 minutes or less since the last determination and the current blood pressure is similar to the previous reading, the monitor will try to make an accelerated determination of blood pressure. During irregular rhythms, only pulses from the current determination are used in calculating the blood pressure values. In order to ensure adequate artifact rejection capability and optimal SuperSTAT NIBP performance, several criteria used to match and qualify the oscillometric pulses at each pressure step are relaxed while supplementing the criteria with additional information from ECG.

NOTE: (Adult/Pediatric only) When ECG is monitored, SuperSTAT NIBP is able to determine blood pressure in the presence of irregular heart rhythms. At the beginning of a SuperSTAT NIBP determination, the coefficient of variation from the previous 120 ECG R-R intervals is used to determine if an irregular rhythm is present.

Accuracy of the NIBP parameter was validated against the intra-arterial method. Do not use the auscultatory method to verify the accuracy of the NIBP parameter. Auscultatory method (using cuff and stethoscope) calculates the mean pressure value from audible sounds at systolic and diastolic, but the NIBP parameter method detects all three values.

WARNING

Arrhythmias will increase the time required by the NIBP parameter to determine a blood pressure.

Alarms

NIBP Alarms		
Name of Alarms	Probable Cause	Response
Systolic High	value is greater than "hi" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
Systolic Low	value is greater than "lo" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
Mean High	value is greater than "hi" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
Mean Low	value is greater than "lo" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
Diastolic High	value is greater than "hi" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
Diastolic Low	value is greater than "lo" alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flash in vital signs field; NIBP OUT of LIMITS message appears in <i>SelectBox</i>
NIBP No Determination*	insufficient signal	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces values to dashes
NIBP Level Timeout*	remained at one cuff pressure level for more than 1 minute due to motion	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces values to dashes
NIBP Total Timeout*	determination time exceeded 2 minutes due to motion artifact	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces values to dashes
NIBP Pump Timeout*	time for inflation was exceeded or air leak detected	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces values to dashes
NIBP Overpressure*	appropriate level or pressure in the cuff has been exceeded	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces values to dashes
* Alarm message appears in <i>SelectBox</i> .		

12 NELLCOR® OXIMAX® SpO₂

Procedure Checklist

1. Select sensor.
2. Plug sensor connector into SpO₂ port.
3. Apply sensor.
4. Select **SpO₂** from the **Setup parameters** option in the **Main Menu**.
5. Set up monitoring parameters.

Description



The SpO₂ parameter in the Dash 2500 Patient Monitor is available in two different leading technologies: NELLCOR® and MASIMO SET®. Please refer to the side of your Monitor to see which SpO₂ technology your Monitor contains. The SpO₂ technology logo will be on the side of the Monitor next to the SpO₂ connector. This section refers to NELLCOR® SpO₂ technology.

Functional oxygen saturation (SpO₂) of arterial blood is monitored in the Dash 2500 Patient Monitor by a pulse oximetry parameter that provides continuous, noninvasive measurements of SpO₂ and can provide displays of pulse rate, a plethysmographic waveform, and a pulse amplitude bar. The pulse amplitude bar graph is proportional to the arterial blood flow. To begin SpO₂ monitoring, plug the sensor into the SpO₂ port, place the SpO₂ sensor on the patient's finger, and monitoring begins automatically.

Functional SpO₂ is the ratio of oxygenated hemoglobin to hemoglobin that is capable of transporting oxygen. This ratio, expressed as a percentage, is shown in the SpO₂ field of the screen and is updated with each heart beat. The percentage of SpO₂ is also indicated by a pulse tone that is activated by the **Adjust QRS volume** option in the **HR/Pulse** menu. The pitch frequency of the tone is proportional to the oxygen saturation value: highest at 100% saturation and lower with each percentage point as the level of saturation falls.

Pulse Rate derived from SpO₂ appears under the following conditions:

- **View SpO₂ PR?** option is set to **yes**:
When pulse rate (PR) is derived from SpO₂, the value appears in the SpO₂ vital signs field.
NOTE: Unless PR is the source for the HR/Pulse, it is only trended when the **View SpO₂ PR?** option is set to **yes**.
- **View SpO₂ PR?** option is set to **no**:
PR will not appear in the SpO₂ vital signs field, but SpO₂ is still a valid source for the HR/Pulse.
- **When SpO₂ is the source for the HR/Pulse:**
Pulse rate derived from SpO₂ appears only in the HR vital signs field (dashes appear for PR in the SpO₂ vital signs field).

The SpO₂ parameter has audible and visible alarms to let you know when the SpO₂ levels are outside the alarm limits, as well as artifact detection. If artifact is detected, the **ARTIFACT** alarm appears under the SpO₂ value in the vital signs area. If the **View SpO₂ PR?** option is set to **yes**, audible and visible alarms for the pulse rate (derived from SpO₂) are activated. The alarm limits for PR are the same as those for HR/Pulse.

*NELLCOR®, OxiMAX®, OxiMAX XL™, OxiCliq®, C-LOCK®, and SatSeconds™ are trademark of Nellcor Puritan Bennett Inc.

Indications and Contraindications

The SpO₂ parameter is indicated for use in continuous, noninvasive monitoring of functional oxygen saturation and in providing pulse rate data as a component of the Dash 2500 Patient Monitor. This device is not designed, sold, or intended for use except as indicated.

WARNINGS

Do not use the SpO₂ parameter during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO₂ measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

The use of cardio-green and other intravascular dyes at certain concentrations may affect the accuracy of the SpO₂ measurement.

The SpO₂ parameter is calibrated to read functional arterial oxygen saturation. Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the SpO₂ measurement.

As with all medical equipment, carefully route patient cabling to reduce the possibility of patient entanglement or strangulation.

Pulse oximetry readings and pulse signals can be affected by certain environmental conditions, sensor application errors, and certain patient conditions. See the appropriate sections of this manual for specific safety information.

The use of accessories, transducers, and cables other than those specified may result in increased emission and/or decreased immunity and inaccurate readings of the Monitor.

A functional tester cannot be used to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor.

CAUTIONS

As with any clip-on sensor, pressure is exerted. The clinician should be cautious in using a clip-on sensor on patients with compromised circulation (e.g., because of peripheral vascular disease or vasoconstricting medications).

Do not perform any testing or maintenance on a sensor while it is being used to monitor a patient.

Bright light sources (e.g., infrared heat lamps, bilirubin lights, direct sunlight, operating room lights) may interfere with the performance of the SpO₂ parameter. To prevent such interference, cover the sensor with opaque material.

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease pulse rate.
- The Dash 2500 Patient Monitor that is labeled with NELLCOR® Technology is compatible only with NELLCOR® OxiMAX® sensors and NELL1 GE cable.
- Software development, software validation, and Risk and Hazard Analysis has been performed to a registered quality system.
- User or patient-applied parts are latex-free.

Procedures

1. Select a sensor that is appropriate for the patient and the clinical situation. Verify that the Monitor's patient type and sensor type match. Sensor sizing must be correct to for the SpO₂ algorithm to function properly.

WARNING

Warning: Do not use a damaged sensor or one with exposed electrical contacts. Do not use sensor, cables, or connectors that appear damaged.

NOTE: To assure optimal performance, use only NELLCOR® sensors, which are available from GE Medical Systems - *Accessories and Supplies* or from NELLCOR or its local representative. Use only NELLCOR® OxiMAX® sensors with PURPLE or WHITE plugs (connectors) and NELL1 GE cables. Use of another pulse oximetry cable will have an adverse effect on performance. Do not attach any cable that is intended for computer use to the sensor port. Do not connect any device other than a NELLCOR® OxiMAX® sensor to the sensor connector.

2. Connect the SpO₂ sensor to the SpO₂ extender cable. Then, connect the SpO₂ cable to the SpO₂ port on the Monitor. (The SpO₂ cable is designed to fit only the SpO₂ port.)
3. Following the directions for use supplied with the sensor, apply the sensor to the patient.

WARNINGS

Patient safety:

If you fail to apply the sensor properly, the patient's skin could be injured or the ability of the SpO₂ parameter to measure oxygen saturation could be compromised. For example, a clip-on sensor should never be taped shut. Taping the sensor could damage the patient's skin or impair the venous return, thus causing venous pulsation and inaccurate measurement of oxygen saturation.

Excessive pressure from the sensor may cause necrosis of the skin.

For additional warnings and information, refer to the NELLCOR® sensor's directions for use.

Parameter performance:

When an SpO₂ sensor is on a limb that has a blood pressure cuff, the SpO₂ data will not be valid when the cuff is inflated. If SpO₂ readings are required during the entire blood pressure determination, attach the SpO₂ sensor to the limb opposite the one with the blood pressure cuff.

Remove nail polish and artificial nails. Placing a sensor on a polished or an artificial nail may affect accuracy.

CAUTIONS

Patient safety:

Do not place any clip-on sensor in a patient's mouth or on a patient's nose or toe.

Do not place a clip-on finger sensor on a patient's thumb or across a child's foot or hand.

The sensor disconnect error message and associated alarm indicate that the sensor is either disconnected or the wiring is faulty. The user should check the sensor connection and, if necessary, replace the sensor, NELL1 GE cable, or both.

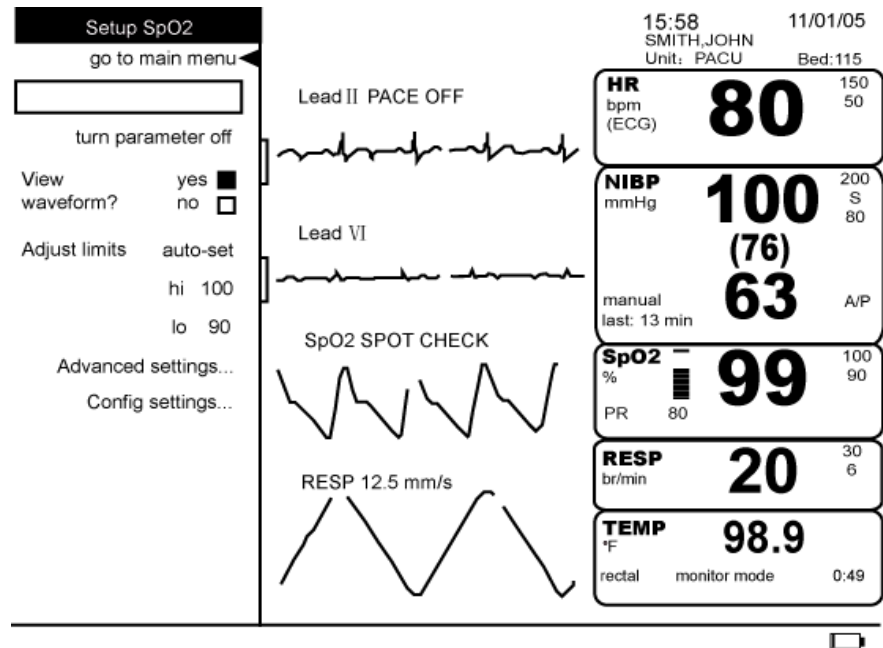
Observe the sensor site to assure adequate distal circulation. Sensor sites should be checked at least every 2 hours and rotated at least every 4 hours.

Parameter performance:

Placing a sensor distal to an arterial line may interfere with adequate arterial pulsation and compromise the measurement of SpO₂.

4. Select **SpO₂** from **Setup parameters** in the **Main Menu** and set up the desired monitoring parameters.

SpO₂ Menu



turn parameter off

This option lets you suspend all monitoring and alarms for SpO₂. When you select this option, no vital sign area is allocated to SpO₂, and the message **offline-SpO₂** appears in the **setup parameters** option. To resume monitoring, select **offline-SpO₂** from the **setup parameters** option.

NOTE: SpO₂ alarms can only be terminated by either: 1) correcting the cause of the alarm, 2) turning the parameter off, or 3) if in spot check, simply acknowledge the alarm.

View waveform?

You can choose this option to have the plethysmographic waveform appear on the screen. Select **yes** or **no**.

Adjust limits

The alarm limits for SpO₂ oxygen saturation and SpO₂ PR are shown in the following tables. Select **hi** to change the high alarm limit and **lo** to change the low alarm limit. The system maintains appropriate separation between the high and low limits.

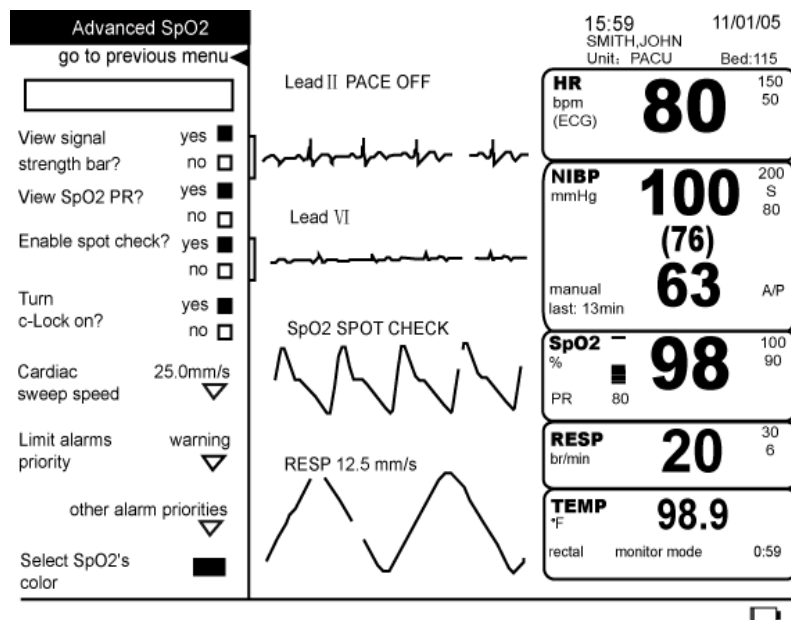
NOTE: The **auto-set** option is not available for SpO₂. You cannot choose **auto-set** to set the alarm limits for oxygen saturation. However, when SpO₂ is the source for HR/Pulse, using the **auto-set** option in the **Setup HR/Pulse** menu will set the alarm limits around the SpO₂ PR value.

SpO ₂ Alarm Limits Saturation: %		
	Low	High
Adult, pediatric and neonatal	20% - 95%	25% - 100%

SpO ₂ Alarm Limits: PR*				
Heart Rate/Pulse	Adjustable		Auto-set choice: 20%, 30%, 40%	
	Low	High	Low	High
adult, pediatric, neonatal	30 - 245 (bpm)	35 - 250 (bpm)	current reading minus chosen percentage	current reading plus chosen percentage

*Only when SpO₂ is the source for HR/Pulse or the **View SpO₂ PR?** option is set to **Yes**.

Advanced settings



View signal strength bar?

This option lets you view the signal strength bar, which is an indication of the strength of the electronic signal produced by the photodiode. A stronger signal makes more bars visible, and a weaker signal makes fewer bars visible. The size of the signal strength bar is proportional to strength of the peripheral pulsations. It does not show changes in percentage of oxygen saturation.

View SpO2 PR?

This option lets you view and trend the pulse rate currently being measured by the SpO₂ parameter. This rate may be different from the value displayed for HR/Pulse, because it is calculated from a different source (i.e., ECG). When viewable, the SpO₂ PR value is also checked against the same limits set for HR/Pulse. If this option is set to **no**, the SpO₂ PR value will only be displayed, trended, and checked against limits when it is the source for HR/Pulse.

Enable spot check?

This option lets you enable or disable the SpO₂ spot check option. Choose **yes** to be able to take individual SpO₂ readings—spot checks—without continuous monitoring. If spot check is enabled, the **SPOT CHECK** message appears next to the SpO₂ label in the waveform area. By enabling the spot check option, you can apply the SpO₂ sensor to the patient, take a reading, then remove the sensor from the patient, acknowledge the **LOST PULSE** or **SENSOR OFF** alarm, and the Monitor returns to READY mode allowing for SpO₂ readings at a later time.

Choose **no** to continuously monitor SpO₂. By disabling the spot check option, when you remove the SpO₂ sensor from the patient a **LOST PULSE** or **SENSOR OFF** alarm sounds indicating continuous monitoring has been interrupted. The Monitor continues to alarm until either the patient signal is detected again or SpO₂ is turned off-line.

Turn c-Lock on?

This option lets you enable and disable NELLCOR® C-LOCK® ECG synchronization. With C-LOCK® enabled, saturation measurements are more reliable.

Cardiac sweep speed

This option lets you set the display sweep speed to **12.5 mm/s**, **25.0 mm/s**, or **50.0 mm/s**. Changes you make to the sweep speed in this menu will effect the sweep speed of all cardiopulmonary waveforms with the possible exception of the primary ECG waveform. The chosen sweep speed appears next to the SpO₂ label in the waveform area when it is a setting other than **25.0 mm/s**.

Limit alarms priority

This option lets you choose the priority of **crisis** or **warning** for the limit alarms. The default limit alarms priority is **warning**.

other alarm priorities

This option lets you choose priorities for **Lost pulse**, **Sensor disconnected**, **Sensor faulty**, and **Sensor off** alarms.

Select SpO2's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Data update period

During normal measurement conditions in the Normal response mode, the averaging time is 6 to 7 seconds and the response time is 2 to 4 seconds in Fast mode. The sum of alarm condition delay and alarm signal generation delay less than 1 second.

Sensor Cleaning and Disinfection

Adhesive sensors are sterile and for single use only. Reusable sensors should be cleaned before reuse with a 70% alcohol solution. If low-level disinfection is required, use a 1:10 bleach solution. Do not use undiluted bleach (5% - 5.25% sodium chlorite) or any cleaning solution other than those recommended here because permanent damage to the sensor could occur. Do not sterilize the sensor by irradiation, steam, or ethylene oxide. If disposable sensors or their packaging are damaged, they must be disposed.

Procedures

1. Saturate a clean, dry gauze pad with the cleaning solution. Wipe all surfaces of the sensor and cable with this gauze pad.
2. Saturate another clean, dry gauze pad with sterile or distilled water. Wipe all surfaces of the sensor and cable with this gauze pad.
3. Dry the sensor and cable by wiping all surfaces with a clean, dry gauze pad.

Calibration

The SpO₂ parameter does not require calibration.

Specifications

Specifications	
Measurement Range	
SpO ₂	1 to 100%
Pulse Rate	20 to 250 bpm
Perfusion Range	0.03 to 20%
Accuracy	
Saturation	
Adult*	70 to 100% ±2 digits
Neonate*	70 to 100% ±3 digits
Low Perfusion**	70 to 100% ±2 digits
Pulse Rate	
Adult and Neonate	20 to 250 bpm ±3 digits
Low Perfusion**	20 to 250 bpm ±3 digits
*Adult specifications are shown for OxiMax®MAX-A and MAX-N sensors with the N-600. Saturation accuracy will vary by sensor type. **Applicability: OxiMax® MAX-A, MAX-AL, MAX-P, MAX-I, and MAX-N sensors.	

Specifications: NELLCOR® OxiMAX® Sensor Accuracy	
NOTE: All NELLCOR® OxiMax® sensors must be used with the NELL1 GE cable; the SCP-10 cable. RS-10 and Oxisensor® II sensors are not compatible with the Dash 2500 Patient Monitor.	
Sensor Model	SpO ₂ Range 70% - 100%
OxiMAX®	
MAX-A, MAX-AL	±2 digits
MAX-N (Adult)	±2 digits
MAX-N [†] (Neonate)	±3 digits
MAX-P	±2 digits
MAX-I	±2 digits
MAX-FAST	±2 digits
SC-A (Adult)	±2 digits
SC-PR (Neonate)	±3 digits
MAX-R [‡]	±3.5 digits

Specifications: NELLCOR® OxiMAX® Sensor Accuracy	
OxiCliq®	
OxiCliq A	±2.5 digits
OxiCliq P	±2.5 digits
OxiCliq N (Adult)	±2.5 digits
OxiCliq N [†] (Neonate)	±3.5 digits
OxiCliq I	±2.5 digits
Reusable Sensor Models	
D-YS (Infant to Adult)	±3 digits
D-YS (Neonate)	±4 digits
D-YS & D-YSE	±3.5 digits
D-YS & D-YSPD	±3.5 digits
DS-100A	±3 digits
OXI-A/N (Adult)	±3 digits
OXI-A/N (Neonate)	±4 digits
OXI-P/I	±3 digits
Neonatal Sensor Accuracy	When sensors are used on neonatal subjects as recommended, the specified accuracy range is increased by ±1 digit, as compared to adult usage, to account for the theoretical effect on oximeter measurements of fetal hemoglobin in neonatal blood. For example, MAX-N accuracy on neonates is ±3 digits, rather than ±2 digits.
Sensor Light Source	
Wavelength	Infrared: 890 nm (nominal) Red: 660 nm (nominal)
Power Dissipation	Infrared: 22.5 mW (max) Red: 30 mW (max)
[†] The MAX-N, D-YS, OXI-A/N, and OxiCliq N were tested on patients >40 kg. [‡] The accuracy specification has been determined between saturations of 80%-100%.	

NELLCOR® Puritan Bennett, Inc. Patents

4,621,643; 4,653,498; Re.35,122; 4,700,708; 4,770,179; 4,802,486; 4,869,254; 4,928,692; 4,934,372; 5,078,136; 5,351,685; 5,421,329; 5,485,847; 5,533,507; 5,577,500; 5,803,910; 5,853,364; 5,865,736; 6,083,172 and international equivalents.

Principle of SatSeconds™

False or nuisance alarms are a common concern in pulse oximetry monitoring. They are often triggered by minor brief desaturation events that are clinically insignificant. SatSeconds is a proprietary Nellcor alarm management technique that helps reduce false and nuisance alarms without risking patient safety.

With traditional alarm management, upper and lower alarm limits are set for monitoring oxygen saturation. During monitoring, as soon as an alarm limit is violated by as little as one percentage point, an audible alarm immediately sounds. When the SpO₂ level fluctuates near an alarm limit, the alarm sounds each time the limit is violated. Such frequent alarms can be distracting. With the *SatSeconds* technique, upper and lower alarm limits are set in the same way as with traditional alarm management. The clinician also sets a *SatSeconds* limit that allows the Monitoring of SpO₂ below the selected low alarm limit and SpO₂ above the selected high alarm limit for a period of time before an audible alarm sounds.

Alarm Response with *SatSeconds*

Saturation levels may fluctuate rather than remain steady for a period of several seconds. Often, the SpO₂ levels may fluctuate above and below the alarm limit, re-entering the non-alarm range several times. During such fluctuations, the pulse oximeter integrates the number of SpO₂ points, both positive and negative, until either the *SatSeconds* limit (*SatSeconds* time setting) is reached, or the SpO₂ level returns to within a normal range and remains there.

Using *SatSeconds*

The *SatSeconds* option is located in the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or contact your local representative. The *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001), which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The signal strength symbol tracks a pulse, but no oxygen saturation or pulse rate values appear on the screen.

CAUSE:

- ◆ Excessive patient motion may be making it impossible for the SpO₂ parameter to find a pulse pattern.
- ◆ The sensor may be damaged.
- ◆ The patient's perfusion may be too low to allow the SpO₂ parameter to measure saturation and pulse rate.
- ◆ The sensor may be in incorrect position.
- ◆ The sensor site may be too thick, too thin, or deeply pigmented or otherwise deeply colored (for example as a result of externally applied coloring such as nail polish, dye or pigmented cream) to permit appropriate light transmission. If any of these situations occurs, reposition the sensor or choose an alternate NELLCOR® sensor for use on a different site.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.
- ◆ Replace the sensor.

PROBLEM: The SpO₂ value or the pulse rate changes rapidly; the signal strength symbol is erratic.

CAUSE:

- ◆ Excessive patient motion may be making it impossible for the SpO₂ parameter to find a pulse pattern.
- ◆ An electrosurgical unit (ESU) may be interfering with performance.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.
- ◆ If an ESU is interfering:
 1. Move the SpO₂ cable as far from the ESU as possible.
 2. Plug the Monitor and the ESU into different AC circuits.

3. Move the ESU ground pad as close to the surgical site as possible.
4. The sensor may be damp or may need to be replaced with a new sensor.
5. Apply an adhesive single-patient use sensor as these sensors have added protection against electrosurgical interference.

PROBLEM: The oxygen saturation measurement does not correlate with the value calculated from a blood gas determination.

CAUSE:

- ◆ The SpO₂ calculation may not have correctly adjusted for the effects of pH, temperature, pCO₂, fetal hemoglobin, or 2, 3-DPG
- ◆ Accuracy can be affected by incorrect sensor application or use, intravascular dyes, bright light, excessive patient movement, venous pulsations, electrosurgical interference, excessive ambient light, presence of nail polish, dye or pigmented cream, and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.

SOLUTION:

- ◆ Check that calculations have been corrected appropriately for the relevant variable. In general, calculated saturation values are not as reliable as direct laboratory hemoximeter measurements.
- ◆ If there is excessive light, cover the sensor with opaque material. On adult or on pediatric patients consider the use of a MAX-A or MAX-P sensor which have an opaque shield to block more ambient light.
- ◆ Circulation distal to the sensor site should be checked routinely. The site must be inspected every 2 hours (or per NELLCOR® sensor's directions for use) to ensure adhesion, skin integrity, and correct optical alignment. If skin integrity changes, move the sensor to another site.
- ◆ Try to keep the patient still, or change the sensor site to one with less motion.
- ◆ Observe all instructions, warnings, and cautions in this manual and in the directions for use of the sensor.

PROBLEM: The SpO₂ signal has disappeared but the value persists, and an alarm does not occur immediately.

CAUSE:

- ◆ The algorithm provides for the SpO₂ value to be maintained for 10 seconds after the signal has disappeared before an alarm is generated.
- ◆ Probe may have become dislodged.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.

PROBLEM: The SpO₂ value and/or PR value is out of limits but a limit alarm is not audible.

CAUSE:

- ◆ The NELLCOR® SpO₂ parameter has been set up to delay alarms using the NELLCOR® SatSeconds™ alarm management software.

SOLUTION:

- ◆ *Check the patient.*
- ◆ Check the configuration setting for SatSeconds™. If greater than zero, the limit alarm will not be generated immediately after the limit is violated. The length of time before the alarm is generated depends both upon how far it is out of limits and for long it has been out of limits.

Alarms

SpO ₂ Alarms		
Name of Alarm	Cause	Response
SpO ₂ High	value is greater than “hi” alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flashes in vital signs field
SpO ₂ Low	value is less than “lo” alarm limit	
SpO ₂ PR High*	value is greater than “hi” alarm limit as set in HR/Pulse	message appears in alarm message field; parameter label, PR label, violated limit, violated PR limit (if limits set to display), and value in violation flashes in vital signs field
SpO ₂ PR Low*	value is less than “lo” alarm limit as set in HR/Pulse	
SpO ₂ Sensor Disconnected	sensor disconnected from module	message appears in waveform and alarm message field; parameter label flashes in vital signs field
SpO ₂ Lost Pulse	no or very low SpO ₂ signal, signal was lost	message appears in waveform field, alarm message field, and in <i>SelectBox</i> when Enable spot check is set to yes; parameter label flashes in vital signs field
SpO ₂ Sensor Faulty	SpO ₂ sensor or cable possibly defective, cable not connected properly	message appears in waveform and alarm message field; parameter label flashes in vital signs field
SpO ₂ Sensor Off	SpO ₂ sensor has been removed from the patient	message appears in waveform field, alarm message field, and in <i>SelectBox</i> when Enable spot check is set to yes; parameter label flashes in vital signs field
* Not active when the View SpO2 PR? option is set to no .		

13 MASIMO SET[®] SpO₂

Procedure Checklist

1. Select sensor.
2. Plug sensor cable into SpO₂ port.
3. Apply sensor.
4. Select **SpO₂** from the **Setup parameters** option in **Main Menu**.
5. Set up monitoring parameters.

Description



The SpO₂ parameter in the Dash 2500 Patient Monitor is available in two different leading technologies: NELLCOR® and MASIMO SET®. The SpO₂ technology logo will be on the side of the Monitor next to the SpO₂ connector. This section refers to MASIMO SET® SpO₂ technology.

Functional oxygen saturation (SpO₂) of arterial blood is monitored in the Dash 2500 Patient Monitor by a pulse oximetry parameter that provides continuous, noninvasive measurements of SpO₂ and can provide displays of pulse rate, a plethysmographic waveform, and a signal strength bar. The signal strength bar is an indication of the confidence associated with the saturation measurement and timing of the pulse. To begin SpO₂ monitoring, plug the sensor cable into the SpO₂ port, place the SpO₂ sensor on the patient's finger, and monitoring begins automatically.

Functional SpO₂ is the ratio of oxygenated hemoglobin to hemoglobin that is capable of transporting oxygen. This ratio, expressed as a percentage, is shown in the SpO₂ field of the screen and is updated with each heart beat. The percentage of SpO₂ is also indicated by a pulse tone that is activated by the **Adjust QRS volume** option in the **HR/Pulse** menu. The pitch frequency of the tone is proportional to the oxygen saturation value: highest at 100% saturation and lower as the level of saturation falls.

Pulse Rate derived from SpO₂ appears under the following conditions:

- **View SpO₂ PR?** option is set to **yes**:
When pulse rate (PR) is derived from SpO₂, the value appears in the SpO₂ vital signs field.
NOTE: Unless PR is the source for the HR/Pulse, it is only trended when the **View SpO₂ PR?** option is set to **yes**.
- **View SpO₂ PR?** option is set to **no**:
PR will not appear in the SpO₂ vital signs field, but SpO₂ is still a valid source for the HR/Pulse.
- **When SpO₂ is the source for the HR/Pulse:**
Pulse rate derived from SpO₂ appears only in the HR vital signs field (dashes appear for PR in the SpO₂ vital signs field).

The SpO₂ parameter has audible and visible alarms to let you know when the SpO₂ levels are outside the alarm limits. If the **View SpO₂ PR?** option is set to **yes**, audible and visible alarms for the pulse rate (derived from SpO₂) are activated. The alarm limits for PR are the same as those for HR/Pulse.

*MASIMO SET® is a trademark of MASIMO Corporation. Possession or purchase of this device does not convey any express or implied license to use the device with replacement parts which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to the device.

Indications and Contraindications

The SpO₂ parameter is indicated for use in continuous, noninvasive monitoring of functional oxygen saturation and in providing pulse rate data as a component of the Dash 2500 Patient Monitor. This device is not designed, sold, or intended for use except as indicated.

WARNINGS

Do not use the SpO₂ parameter during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO₂ measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

The use of cardio-green and other intravascular dyes at certain concentrations may affect the accuracy of the SpO₂ measurement.

The SpO₂ parameter is calibrated to read functional arterial oxygen saturation. Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the SpO₂ measurement.

A functional tester cannot be used to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor.

CAUTIONS

If any measurement does not seem reasonable, first check the patient's vital signs by alternate means and then check the pulse oximeter for proper functioning.

Inaccurate measurements may be caused by:

- ◆ Incorrect sensor application or use
- ◆ Significant levels of dysfunctional hemoglobins (e.g., carboxyhemoglobin or methemoglobin)
- ◆ Intravascular dyes such as indocyanine green or methylene blue
- ◆ Exposure to excessive illumination, such as surgical lamps (especially ones with xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps, or direct sunlight (exposure to excessive illumination can be corrected by covering the sensor with a dark or opaque material)
- ◆ venous pulsations
- ◆ placement of sensor on an extremity with a blood pressure cuff, arterial catheter, or intravascular line

The pulse oximeter can be used during defibrillation, but the readings may be inaccurate for a short time.

Loss of pulse signal can occur in any of the following situation:

- ◆ the sensor is too tight
- ◆ there is excessive illumination from light sources such as surgical lamp, a bilirubin lamp, or sunlight
- ◆ a blood pressure cuff is inflated on the same extremity as the one with a SpO₂ sensor attached
- ◆ the patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia
- ◆ there is arterial occlusion proximal to the sensor
- ◆ the patient is in cardiac arrest or is in shock

Sensors:

Before use, carefully read the MASIMO® sensor directions for use.

Use only MASIMO® oximetry sensors for SpO₂ measurements. Other oxygen transducers (sensors) may cause improper SpO₂ performance.

CAUTIONS

Tissue damage can be caused by incorrect application or use of a MASIMO® sensor, for example by wrapping the sensor too tightly. Inspect the sensor site as directed in the sensor Directions for Use to ensure skin integrity and correct positioning and adhesion of the sensor.

Do not use damaged MASIMO® sensors. Do not use a MASIMO® sensor with exposed optical components. Do not immerse the sensor in water, solvents, or cleaning solutions (the sensors and connectors are not waterproof). Do not sterilize by irradiation, steam, or ethylene oxide. See the cleaning instructions in the directions for use for reusable MASIMO® sensors.

Do not use damaged patient cables. Do not immerse the patient cables in water, solvents, or cleaning solutions (the patient cable connectors are not waterproof). Do not sterilize by irradiation, steam, or ethylene oxide. See the cleaning instructions in the directions for use for reusable MASIMO® patient cables.

Do not use the SpO₂ function during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO₂ measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

The use of cardio-green and other intravascular dyes at certain concentrations may affect the accuracy of the SpO₂ measurement.

The SpO₂ function is calibrated to read functional arterial oxygen saturation. Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the SpO₂ measurement.

The use of accessories, transducers, and cables other than those specified may result in increased emission and/or decreased immunity and inaccurate readings of the Monitor.

As with any clip-on sensor, pressure is exerted. The clinician should be cautious in using a clip-on sensor on patients with compromised circulation (e.g., because of peripheral vascular disease or vasoconstricting medications).

Do not perform any testing or maintenance on a sensor while it is being used to monitor a patient.

Bright light sources (e.g., infrared heat lamps, bilirubin lights, direct sunlight, operating room lights) may interfere with the performance of the SpO₂ function. To prevent such interference, cover the sensor with opaque material.

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease pulse rate.
- The Dash 2500 Patient Monitor that is labeled with MASIMO SET® Technology is compatible only with MASIMO SET® sensors.
- Software development, software validation, and Risk and Hazard Analysis has been performed to a registered quality system.
- User or patient-applied parts are latex-free.

Procedures

1. Select a sensor that is appropriate for the patient and the clinical situation. Verify that the Monitor's patient type and sensor type match. Sensor sizing must be correct to for the SpO₂ algorithm to function properly.

WARNING

Do not use a damaged sensor or one with exposed electrical contacts.

NOTE: To assure optimal performance, use only MASIMO SET® sensors, which are available from GE Medical Systems - *Accessories and Supplies*.

2. Connect the SpO₂ sensor to the SpO₂ extender cable. Then, connect the SpO₂ cable to the SpO₂ port on the Monitor. (The SpO₂ cable is designed to fit only the SpO₂ port.)
3. Following the directions for use supplied with the sensor, apply the sensor to the patient.

WARNINGS

Patient safety:

If you fail to apply the sensor properly, the patient's skin could be injured or the ability of the SpO₂ parameter to measure oxygen saturation could be compromised. For example, a clip-on sensor should never be taped shut. Taping the sensor could damage the patient's skin or impair the venous return, thus causing venous pulsation and inaccurate measurement of oxygen saturation.

Excessive pressure from the sensor may cause necrosis of the skin.

Parameter performance:

When an SpO₂ sensor is on a limb that has a blood pressure cuff, the SpO₂ data will not be valid when the cuff is inflated. If SpO₂ readings are required during the entire blood pressure determination, attach the SpO₂ sensor to the limb opposite the one with the blood pressure cuff.

WARNING

Remove nail polish and artificial nails. Placing a sensor on a polished or an artificial nail may affect accuracy.

CAUTIONS

Patient safety:

Do not place any clip-on sensor in a patient's mouth or on a patient's nose.

Do not place a clip-on finger sensor on a patient's thumb or across a child's foot or hand.

Observe the sensor site to assure adequate distal circulation. Sensor sites should be checked as instructed in the MASIMO Directions for Use supplied with the SpO₂ probe. Different sites call for varying times between checks. Sensor sites should be changed at least every 4 hours.

Parameter performance:

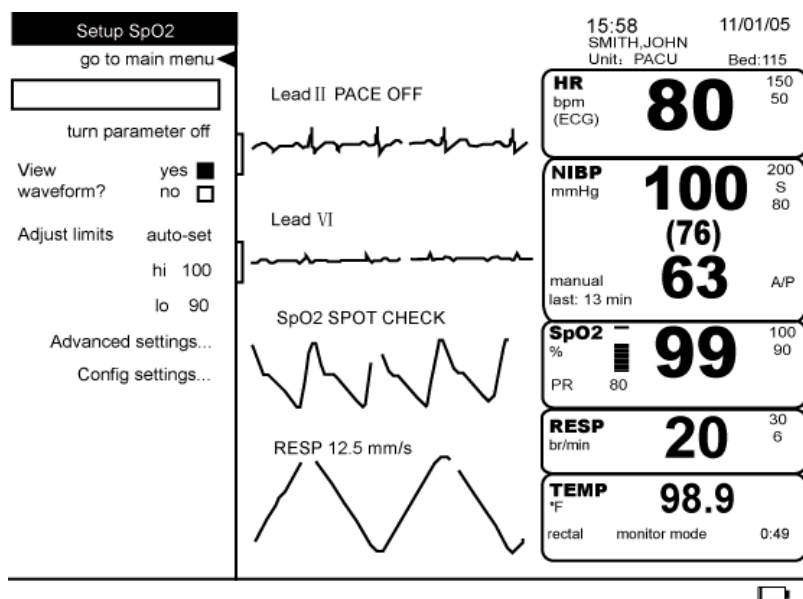
For best performance, place the sensor at heart level.

Placing a sensor distal to an arterial line may interfere with adequate arterial pulsation and compromise the measurement of SpO₂.

Place the sensor so that the LEDs (light emitting diode) and the photodiode are opposite each other.

4. Select **SpO2** from **Setup parameters** in the **Main Menu** and set up the desired monitoring parameters.

SpO₂ Menu



turn parameter off

This option lets you suspend all monitoring and alarms for SpO₂. When you select this option, no vital sign area is allocated to SpO₂, and the message **offline-SpO2** appears in the **setup parameters** option. To resume monitoring, select **offline-SpO2** from the **setup parameters** option.

NOTE: SpO₂ alarms can only be terminated by either: 1) correcting the cause of the alarm, 2) turning the parameter off, or 3) if in spot check, simply acknowledge the alarm.

View waveform?

You can choose this option to have the plethysmographic waveform appear on the screen. Select **yes** or **no**.

Adjust limits

The alarm limits for SpO₂ oxygen saturation and SpO₂ PR are shown in the following tables. Select **hi** to change the high alarm limit and **lo** to change the low alarm limit. The system maintains appropriate separation between the high and low limits.

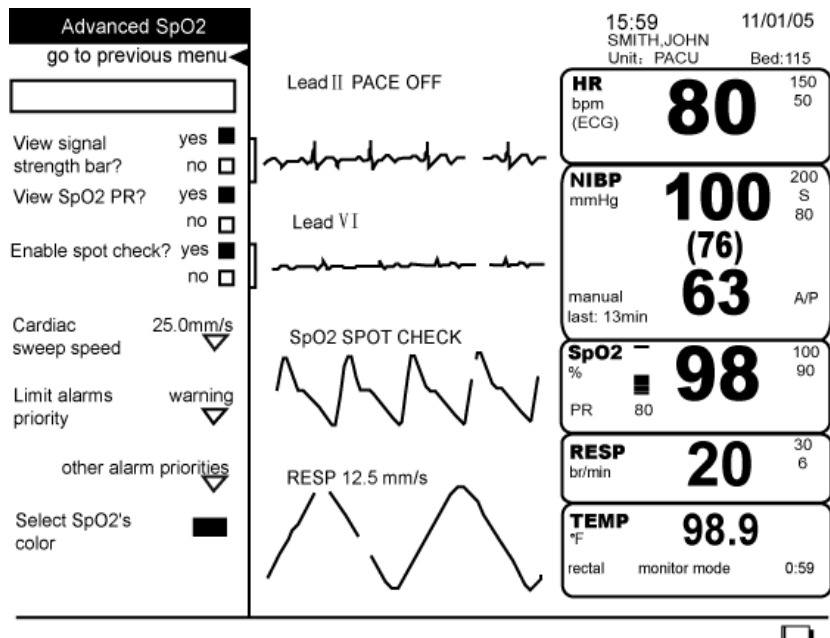
NOTE: The **auto-set** option is not available for SpO₂. You cannot choose the **auto-set** option to set the alarm limits for oxygen saturation. However, when SpO₂ is the source for HR/Pulse, using **auto-set** in the **Setup HR/Pulse** menu will set the alarm limits around the SpO₂ PR value.

SpO ₂ Alarm Limits saturation: %		
	Low	High
adult, pediatric and neonatal	20% - 95%	25% - 100%

SpO ₂ Alarm Limits: PR*				
Heart Rate/Pulse	Adjustable		Auto-set choice: 20%, 30%, 40%	
	Low	High	Low	High
adult, pediatric, neonatal	30 - 245 (bpm)	35 - 250 (bpm)	current reading minus chosen percentage	current reading plus chosen percentage

* Only when SpO₂ is the source for HR/Pulse or the **View SpO₂ PR?** option is set to **Yes**.

Advanced settings



View signal strength bar?

This option lets you view the signal strength bar, which is an indication of the strength of the electronic signal produced by the photodiode.

View SpO2 PR?

This option lets you view and trend the pulse rate currently being measured by the SpO₂ parameter. This rate may be different from the value displayed for HR/Pulse, because it is calculated from a different source (i.e., ECG). When viewable, the SpO₂ PR value is also checked against the same limits set for HR/Pulse. If this option is set to **no**, the SpO₂ PR value will only be displayed, trended, and checked against limits when it is the source for HR/Pulse.

Enable spot check?

This option lets you enable or disable the SpO₂ spot check option. Choose **yes** to be able to take individual SpO₂ readings—spot checks—without continuous monitoring. If spot check is enabled, the **SPOT CHECK** message appears next to the SpO₂ label in the waveform area. By enabling the spot check option, you can apply the SpO₂ sensor to the patient, take a reading, then remove the sensor from the patient, acknowledge the **LOST PULSE** or **SENSOR OFF** alarm, and the Monitor returns to READY mode allowing for SpO₂ readings at a later time.

Choose **no** to continuously monitor SpO₂. By disabling the spot check option, when you remove the SpO₂ sensor from the patient a **LOST PULSE** or **SENSOR OFF** alarm sounds indicating continuous monitoring has been interrupted. The Monitor continues to alarm until either the patient signal is detected again or SpO₂ is turned off-line.

Cardiac sweep speed

This option lets you set the display sweep speed to **12.5 mm/s**, **25.0 mm/s**, or **50.0 mm/s**. Changes you make to the sweep speed in this menu will affect the sweep speed of all cardiopulmonary waveforms with the possible exception of the primary ECG waveform. The chosen sweep speed appears next to the SpO₂ label in the waveform area when it is a setting other than **25.0 mm/s**.

Limit alarms priority

This option lets you choose the priority of **crisis** or **warning** for the limit alarms. The default limit alarms priority is **warning**.

other alarm priorities

This option lets you choose priorities for **sensor disconnected**, **lost pulse**, **sensor off**, **signal quality** and **sensor faulty** alarms.

Select SpO2's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Data update period

Via the menu, there are different averaging times that can be selected (2-4, 4-6, 8, 10, 12, 14, 16 seconds). FastSat is always on for 2-4 seconds and 4-6 seconds averaging modes. The sum of alarm condition delay and alarm signal generation delay less than 1 second.

Sensor Cleaning and Disinfection

Adhesive sensors are sterile and for single use only. Reusable sensors should be cleaned before reuse with a 70% alcohol solution. If low-level disinfection is required, use a 1:10 bleach solution. Do not use undiluted bleach (5% - 5.25% sodium chlorite) or any cleaning solution other than those recommended here because permanent damage to the sensor could occur. Do not sterilize the sensor by irradiation, steam, or ethylene oxide. If disposable sensors or their packaging are damaged, they must be disposed.

Procedures

1. Saturate a clean, dry gauze pad with the cleaning solution. Wipe all surfaces of the sensor and cable with this gauze pad.
2. Saturate another clean, dry gauze pad with sterile or distilled water. Wipe all surfaces of the sensor and cable with this gauze pad.
3. Dry the sensor and cable by wiping all surfaces with a clean, dry gauze pad.

Calibration

The SpO₂ parameter does not require calibration.

Specifications

Specifications	
Measurement Range	
SpO ₂	1 to 100%
Pulse Rate	25 to 240 bpm
Perfusion Range	0.02 to 20%
Accuracy and Motion Tolerance	
Saturation	
Without Motion - Adult/Pediatric*	70 to 100% ±2 digits
Without Motion - Neonate*	70 to 100% ±3 digits
With Motion - Adult/Pediatric/Neo**†	70 to 100% ±3 digits
Low Perfusion‡	70 to 100% ±2 digits 0 to 69% unspecified
Pulse Rate	
Without Motion	25 to 240 bpm ±3 digits
With Motion	normal physiologic range 25 to 240 bpm ±5 digits
* The MASIMO SET® SpO₂ parameter with LNOP-Adt sensors has been validated for no motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies in the range of 70-100% SpO₂ against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. **The MASIMO SET® SpO₂ parameter with LNOP-Adt sensors has been validated for motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies while performing rubbing and tapping motions at 2 to 4 Hz at an amplitude of 1 to 2 cm and a nonrepetitive motion between 1 to 5 Hz at an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70-100% SpO₂ against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. †The MASIMO SET® SpO₂ parameter with LNOP-Neo Pt sensors has been validated for neonatal motion accuracy in human blood studies on neonates while moving the neonate's foot at 2 to 4 cm against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus, one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. ‡The MASIMO SET® SpO₂ parameter has been validated for low perfusion accuracy in bench top testing against a Biotek Index 2 simulator and MASIMO's simulator with signal strengths of greater than 0.02% and a % transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus, one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. NOTE: LNCS sensors using LNCS cable technology offer nearly the same performance as the LNOP flex-circuit design. The LNOP single patient sensor line is still the industry "gold standard", while LNCS is the best cabled sensor alternative.	

Specifications: MASIMO® Sensor Accuracy	
Sensor Model	SpO ₂ Range 70% - 100%
LNOP	
LNOP-ADT	± 2 digits
LNOP-ADT Long	± 2 digits
LNOP-PDT	± 2 digits
LNOP-NEO	± 3 digits
LNOP-NEO PT	± 3 digits
LNOP-DCI (reusable)	± 2 digits
LNOP-DCSC (reusable)	± 2 digits
LNOP-DCIP (reusable)	± 2 digits
NRI25 (reusable)	± 2 digits
Resolution	
Saturation (% SpO ₂)	1%
Pulse Rate (bpm)	1
Low Perfusion Performance	
0.02% Pulse Amplitude	Saturation (% SpO ₂) ±2 digits
and% Transmission >5%	Pulse Rate ±3 digits
Interfering Substances	Carboxyhemoglobin may erroneously increase readings. The level of increase is approximately equal to the amount of carboxyhemoglobin present. Dyes, or any substance containing dyes, that change usual arterial pigmentation may cause erroneous readings.
Sensor Light Source	
Wavelength	Infrared: 905 nm (nominal) Red: 660 nm (nominal)
Power Dissipation	Infrared: 22.5 mW (max) Red: 27.5 mW (max)

MASIMO® Patents

5,482,036; 5,490,505; 5,632,272; 5,685,299; 5,758,644; 5,769,785; 6,002,952; 6,036,642; 6,067,462; 6,157,850; 6,206,830; 6,263,222 and international equivalents.

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local representative. The *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001), which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The signal strength symbol tracks a pulse, but no oxygen saturation or pulse rate values appear on the screen.

CAUSE:

- ◆ Excessive patient motion may be making it impossible for the SpO₂ parameter to find a pulse pattern.
- ◆ The sensor may be damaged.
- ◆ The patient's perfusion may be too low to allow the SpO₂ parameter to measure saturation and pulse rate.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.
- ◆ Replace the sensor.

PROBLEM: The SpO₂ value or the pulse rate changes rapidly; the signal strength symbol is erratic.

CAUSE:

- ◆ Excessive patient motion may be making it impossible for the SpO₂ parameter to find a pulse pattern.
- ◆ An electrosurgical unit (ESU) may be interfering with performance.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.
- ◆ If an ESU is interfering:
 1. Move the SpO₂ cable as far from the ESU as possible.
 2. Plug the Monitor and the ESU into different AC circuits.
 3. Move the ESU ground pad as close to the surgical site as possible.
 4. The sensor may be damp or may need to be replaced with a new sensor.
 5. If using a sensor extension cable, remove it and connect the sensor directly to the SpO₂ port.

PROBLEM: The oxygen saturation measurement does not correlate with the value calculated from a blood gas determination.

CAUSE:

- ◆ The SpO₂ calculation may not have correctly adjusted for the effects of pH, temperature, pCO₂, fetal hemoglobin, or 2, 3-DPG
- ◆ Accuracy can be affected by incorrect sensor application or use, intravascular dyes, bright light, excessive patient movement, venous pulsations, electrosurgical interference, and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.

SOLUTION:

- ◆ Check that calculations have been corrected appropriately for the relevant variable. In general, calculated saturation values are not as reliable as direct laboratory hemoximeter measurements.
- ◆ If there is excessive light, cover the sensor with opaque material.
- ◆ Circulation distal to the sensor site should be checked routinely. The site must be inspected every 2 hours to ensure adhesion, skin integrity, and correct optical alignment. If skin integrity changes, move the sensor to another site.
- ◆ Try to keep the patient still, or change the sensor site to one with less motion.
- ◆ Observe all instructions, warnings, and cautions in this manual and in the directions for use of the sensor.

PROBLEM: An SpO₂ signal quality alarm has occurred.

CAUSE:

- ◆ Weak or “noisy” signal.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.
- ◆ If there is excessive light, cover the sensor with opaque material.

PROBLEM: The SpO₂ signal has disappeared but the value persists, and an alarm does not occur immediately.

CAUSE:

- ◆ Probe may have become dislodged.

SOLUTION:

- ◆ *Check the patient.*
- ◆ If possible, keep the patient still; check whether the sensor is applied securely and properly and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.

PROBLEM: An SpO₂ sensor is attached to the Monitor, but there is no SpO₂ activity.

CAUSE:

- ◆ An incorrect sensor may have been chosen. Sensors made by other manufacturers will not be recognized.

SOLUTION:

- ◆ Check that the sensor is one of the approved MASIMO sensors.

Alarms

SpO ₂ Alarms		
Name of Alarm	Cause	Response
SpO ₂ High	value is greater than “hi” alarm limit	message appears in alarm message field; parameter label, violated limit (if limits set to display), and value in violation flashes in vital signs field
SpO ₂ Low	value is less than “lo” alarm limit	
SpO ₂ PR High*	value is greater than “hi” alarm limit as set in HR/Pulse	message appears in alarm message field; parameter label, PR label, violated limit, violated PR limit (if limits set to display), and value in violation flashes in vital signs field
SpO ₂ PR Low*	value is less than “lo” alarm limit as set in HR/Pulse	
SpO ₂ Sensor Disconnected	sensor disconnected from module	message appears in waveform and alarm message field; parameter label flashes in vital signs field
SpO ₂ Lost Pulse	no or very low SpO ₂ signal, signal was lost	message appears in waveform field, alarm message field, and in <i>SelectBox</i> when Enable spot check enable is set to yes; parameter label flashes in vital signs field
SpO ₂ Sensor Off	SpO ₂ sensor has been removed from the patient	message appears in waveform field, alarm message field, and in <i>SelectBox</i> when Enable spot check is set to yes; parameter label flashes in vital signs field
SpO ₂ Signal Quality	low perfusion, excessive patient movement, too much ambient light or interference from another source is degrading the quality of the signal	message appears in waveform and alarm message field; parameter label flashes in vital signs field
SpO ₂ Sensor Faulty	SpO ₂ sensor or cable possibly defective, cable not connected properly	message appears in waveform and alarm message field; parameter label flashes in vital signs field
* Not active when the View SpO2 PR? option is set to no .		

14 Alaris® Turbo Temp®

Procedure Checklist

1. Select temperature probe.
2. Connect probe cable to monitor.
3. Insert temperature probe in the appropriate place of the patient.
4. Select **TEMP** from the **Setup parameters** option in **Main Menu**.
5. Make sure correct determination mode is chosen.
6. Set up monitoring parameters.

Description

The temperature parameter in the Dash 2500 Patient Monitor uses Alaris® Turbo Temp® technology and can be used with both oral (blue) and rectal (red) temperature probes. While a determination is in progress, all information in the vital signs area appears either red or blue, respective to the type of temperature probes being used. Two modes of operation are available: predictive and monitor. If a determination can be started, it begins when the temperature probe is removed from the probe holster. The Monitor beeps once whenever a temperature probe is removed from or returned to the probe holster.

NOTES

- When any temperature alarms are generated, dashes are displayed in the vital signs area and any determination in progress is terminated. To cancel these alarms, return the temperature probe to the probe holster, choose the alarm message in the *SelectBox*, or choose the **turn parameter off** option.
- Once the probe has been removed from the probe holster and anytime the temperature parameter is turned off, all old determination values are cleared.

Temperature is shown in the vital signs area in degrees Celsius or Fahrenheit, and the unit of measure is indicated by the °C or °F display.

Indications and Contraindications

The Dash 2500 Patient Monitor is indicated for monitoring temperature. This device is not designed, sold, or intended for use except as indicated.

WARNING

The performance of the Monitor may be degraded if it is operated outside of the environmental conditions specified.

CAUTIONS

Be careful not to overextend the coiled cord of the temperature probe. Overextension can damage the probe coil connector interfaces.

Accurate oral temperatures (blue) can only be obtained by placing the probe under the tongue in the right or left sublingual pocket. Temperatures in other locations in the mouth can vary by more than 2°F or 1°C.

Accurate rectal temperatures can only be obtained by using the red temperature probe. Red and blue temperature probes are *not* interchangeable.

* Alaris® Turbo Temp® is a trademark of Cardinal Health, Inc.

CAUTIONS

Do not allow the tip of the predictive temperature probe to come into contact with a heat source (e.g., hands or fingers) prior to taking a temperature determination. If this occurs, allow 5 seconds for the probe tip to cool before proceeding.

Use only Alaris probes and probe covers. The size, shape, and thermal characteristics of the probe covers can affect the performance of the instrument. Inaccurate readings or retention problems may occur unless Alaris probes and probe covers are used. To avoid cross contamination, use each cover only once.

Electromagnetic Compatibility: Operating the thermometer near equipment which radiates high-energy electromagnetic and radio frequencies (electrosurgical/cauterizing equipment, portable radios, cellular telephones, etc.) may cause false alarm conditions. If this happens, reposition the thermometer away from the source of interference and perform a new measurement.

If a patient's temperature is below 96.0°F (35.6°C), the unit will automatically switch from the normal mode into the Monitor mode within 10 seconds. It will continue to monitor the patient's temperature until the probe is returned to the probe holster.

Predictive Mode

In predictive mode, a final temperature is displayed. The sound of the first beep signals that the temperature determination is complete, and the Monitor continues beeping for up to 11 beeps or stops when the probe is replaced into the probe holster. When a predictive mode determination is in progress, the determination terminates when a final value is achieved, when the probe is inserted back into the probe holster, or when a TEMP status alarm is issued. During a predictive temperature determination, the temperature display provides a progress meter. In the vital signs area, four arrows forming a "chase sequence" indicate a predictive temperature determination is in progress. The "chase sequence" will stop and restart with loss and recovery of tissue contact.

When a predictive determination ends in a final value, the time since the determination completed is displayed in the vital signs area in the format of **last: xxx min** where **xxx** is the number of minutes since the determination completed. The final temperature value remains in the vital signs area until a new determination begins or until 120 minutes have lapsed. After that time, dashes replace the old determination value, and **last:xxx** is no longer displayed.

Monitor Mode

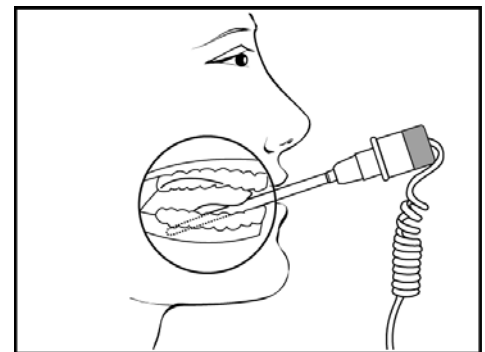
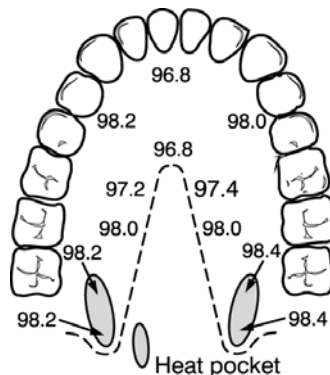
Monitor mode is most commonly used for axillary temperature determinations. In monitor mode, the display is updated continually as the patient's temperature rises or falls. When a monitor mode determination is in progress, the **MONITOR MODE** message displays under the temperature value in the vital signs area, and dashes are displayed until the temperature value is equal to or above 80.0°F. Once the temperature is above 80.0°F, values appear in the vital sign area. The determination terminates when the probe is inserted back into the probe holster or a TEMP status alarm is issued.

A time indicator in the vital signs area shows the length of time since the probe was last removed from the probe holster. It appears in the format of **YY : XX** where **YY** is the elapsed minutes and **XX** is the elapsed seconds. When the length of determination extends to over 60 minutes, dashes (--) appear, but the temperature value remains. When monitor mode is in progress and a recording is started, the temperature value is printed out as dashes.

Procedures for Oral Predictive Mode Determinations

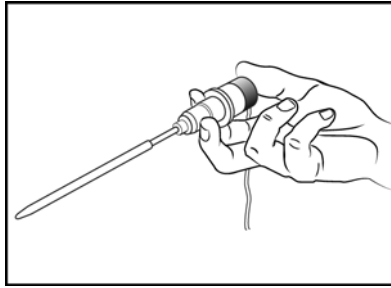
For oral temperature measurement, use the blue oral probe.

1. Ensure blue probe is in the holster.
2. Connect the temperature probe cable to the temperature probe connector.
3. Make sure correct determination mode is selected.
4. Remove the temperature probe from the probe holster (the Monitor beeps once). Place a protective temperature probe cover on the probe. Failure to firmly install the probe cover may result in the probe cover becoming loose or disengaged during use. Be careful not to push the probe ejection button where the cord exits the probe as this might loosen or eject the probe cover.
5. Have the patient open his/her mouth slightly. Holding the probe loosely, insert the probe tip into the sublingual pocket where the richest blood is located.



To take an accurate oral temperature reading, place the the thermometer tip in either the right or left posterior pocket (heat pocket) at the base of the tongue.

6. Hold the probe during the entire temperature measurement process, and keep the probe tip in contact with the tissue at all times. Do not allow the patient to reposition the probe.
7. The determination begins automatically. Hold the temperature probe steady until the determination is complete. This takes approximately 10 seconds, during which time a pattern of arrows in the vital signs area appears as a “chase sequence” to indicate progress.
8. When the determination is complete, up to 12 beeps sound and the temperature appears on the display.



9. Remove the probe. Discard the disposable cover by holding the probe as you would a syringe and pushing the button on the probe handle. Place the probe in the holster (the Monitor beeps once).

Procedures for Rectal Predictive Mode Determinations

For rectal temperature measurement use the red rectal probe.

1. Ensure red probe is in the holster.
2. Connect the temperature probe cable to the temperature probe connector.
3. Make sure correct determination mode is selected.
4. Remove the temperature probe from the probe holster (the Monitor beeps once). Place a protective temperature probe cover on the probe. Failure to firmly install the probe cover may result in the probe cover becoming loose or disengaged during use. Be careful not to push the probe ejection button where the cord exits the probe as this might loosen or eject the probe cover.
5. Touch the tissue about a half inch (1.3 cm) above the sphincter muscle and carefully insert the probe, using current hospital technique for penetration. (The use of a lubricant is optional.) Do not insert the probe too deep or overexert and make sure the probe cover is smooth, otherwise it might hurt the patient.
6. The determination begins automatically. To ensure continuous tissue contact and maximize patient comfort, hold the probe in position until the determination is complete. This takes approximately 10 seconds, during which time a pattern of arrows in the vital signs area appears as a “chase sequence” to indicate progress.
7. When the determination is complete, up to 12 beeps sound, and the temperature value and the label **rectal** appears on the display.
8. Remove the probe. Discard the disposable cover by holding the probe as you would a syringe and pushing the button on the probe handle. Place the probe in the probe holster (the Monitor beeps once).

Procedures for Monitor Mode Determinations (Axillary Determinations)

1. Ensure blue probe is in the holster.
2. Make sure correct determination mode is selected.



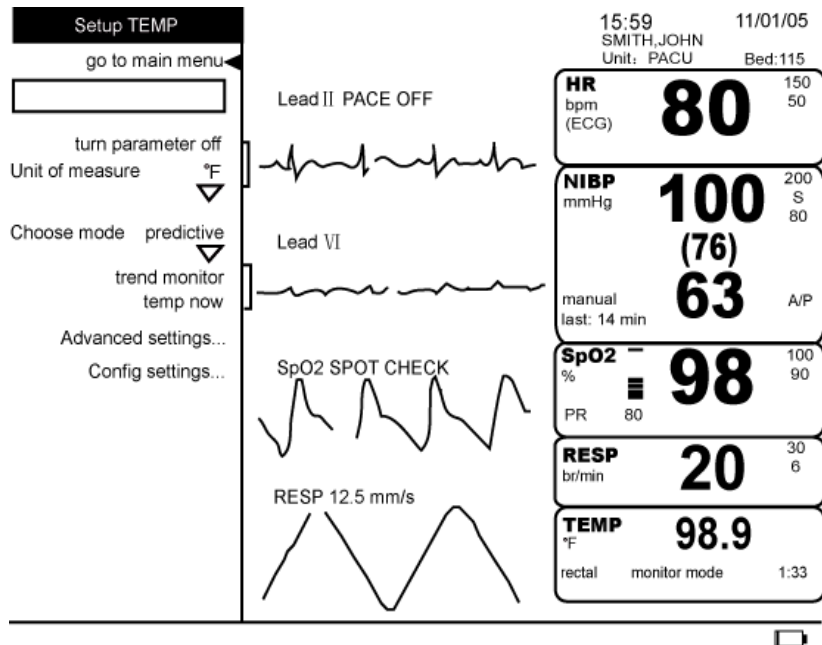
3. Remove the appropriate temperature probe from the probe holster (the Monitor beeps once). Place a protective temperature probe cover on the probe and insert the probe in the patient's axilla, making sure the tip of the probe is in contact with the skin and positioned as close as possible to the axillary artery with the patient's arm held close to his/her side.

4. The determination begins automatically. The dashes in the vital signs area are replaced with a temperature value as soon as the probe warms up. Leave the probe in place for the same length of time as required by standard hospital procedure for taking an axillary temperature. The Monitor does not beep to indicate a final reading.
5. Choose **trend monitor temp now** (if you want to save the value in trends), and remove the probe. Discard the disposable cover by holding the probe as you would a syringe and pushing the button on the probe handle. Place the probe in the probe holster (the Monitor beeps once). Once you place the probe in the probe holster, the temperature values will be cleared.

Notes

- If there is a long delay from the time the probe is removed from the probe holster until it is inserted into the patient's mouth, it is possible that the instrument will not display a final predictive temperature. If this occurs, insert the probe into the probe holster, remove it again, and start a new measurement.
- If an alarm is actively sounding, an audible temperature tone will not sound.
- If a predictive determination value is not achieved within 40 seconds of probe removal, the Monitor switches to monitor mode.
- If the probe tip temperature is 92.0°F (33.3°C) or higher or 60°F (15.6°C) or lower when taken out of the probe holster, the thermometer will not be able to perform a predictive measurement. Instead, the thermometer will automatically go into monitor mode. The temperature reading will then flash. A correct final temperature reading may require 3 minutes or longer. The Monitor will not beep at final temperature. It will continue to monitor the patient's temperature until the probe is removed from the patient and returned to the probe holster.

TEMP Menu



turn parameter off

This option lets you suspend all monitoring and alarms for TEMP. When you select this option, no vital sign area is allocated to TEMP, and the message **offline-TEMP** appears in the **setup parameters** option. To resume monitoring, either insert temperature probe in patient, or select **offline-TEMP** from the **setup parameters** option.

Unit of measure

You can choose to have temperature displayed in degrees Fahrenheit or degrees Celsius.

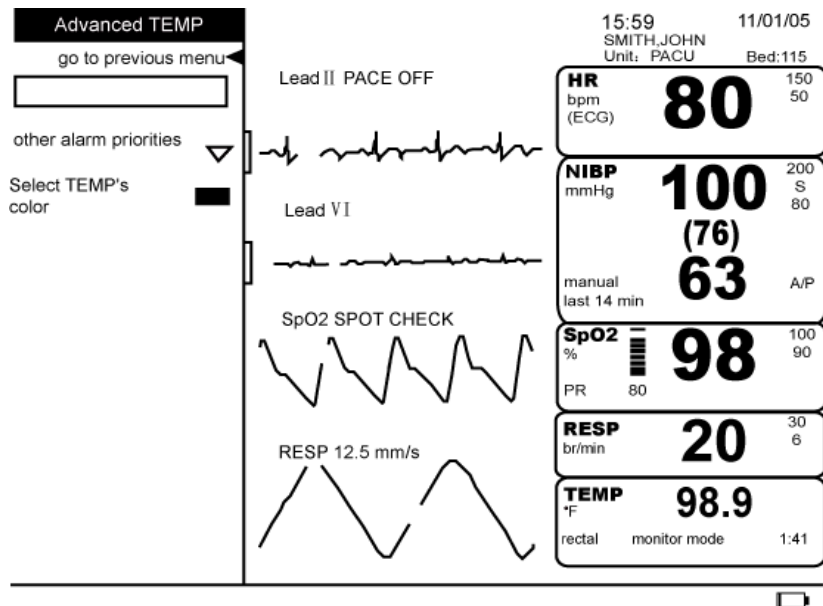
Choose mode

This option lets you choose either **predictive** or **monitor** mode. If no temperature determination is in progress, this choice specifies the type of determination that will be attempted on the next probe removal. If a **predictive** determination is in progress and you choose **monitor** mode, the mode of determination in progress switches from predictive to monitor. If a monitor mode determination is in progress, this option is not available.

trend monitor temp now

Choosing this option causes the currently displayed temperature value to be trended. This option is available only during a monitor mode determination when the parameter indicates that values are available for trending. This option becomes available only after the temperature values are displayed in the vital signs area. A maximum of eight temperature values can be trended per minute.

Advanced Settings



other alarm priorities

This option lets you choose the priority for temperature alarms.

Select TEMP's color

This option lets you change the color of this parameter's vital signs that appear on the Monitor screen.

Config settings

This option allows you to view, but not change, the various configuration options. To change any config option, you must go into the password-protected Configuration Mode. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Probe Cleaning and Disinfection

Do not immerse predictive temperature probes. The probe can be cleaned with a solution of 10% bleach in water. Use a cloth or sponge-just damp, not wet-and avoid getting any liquid into the interior of the probe.

Calibration

The temperature parameter does not require calibration.

Specifications

Specifications	
Scale	° Fahrenheit (F) ° Celsius (C)
Predictive Mode	
Range	96.0°F (35.6°C) to 106.0°F (41.1°C)
Resolution	0.1°F (0.1°C)
Monitor Mode	
Range	80.0°F (26.7°C) to 108.0° F (42.2°C)
Accuracy	± 0.2°F (± 0.1°C) (when tested in a calibrated liquid bath; meets ASTM E1112, Table 1, in range specified)
Resolution	0.1°F (0.1°C)
Probes	CAUTION: Use only Alaris® probes and probe covers. The size, shape, and thermal characteristics of the probe covers can affect the performance of the instrument. Inaccurate readings or retention problems may occur unless Alaris® probes and probe covers are used.
Determination Time	Approx. 10 seconds, typical

Alaris® Patents

U.S. D300,728, D300,909. Other pending patents.

Alarms

Temperature Alarms		
Name of Alarm	Cause	Message
TEMP Disconnected	temperature probe becomes disconnected	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes
TEMP Bad Probe	the measured temp value is determined to be out of limits OR bad probe	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes
TEMP Too Hot	the measured temp value is determined to be above the upper limit	message appears in alarm message field; parameter label flashes in vital signs field; alarm forces value to dashes

15 Battery

Procedure Checklist

1. Only use batteries recommended by GE Medical Systems *Information Technologies*.
2. Make sure the battery has been fully charged before using Monitor.
(See instructions for new batteries.)
3. Check the battery icon for the state of charge indication.

Description

The Dash 2500 Patient Monitor uses an internal battery pack. The battery pack is nickel-metal-hydride (NiMH) that can be charged at any time without fear of reducing its charge capacity. Battery connectors are keyed to prevent incorrect installation. In the event the Monitor loses AC power, the unit automatically switches to battery power.

WARNINGS

Do not disassemble, open, or shred the battery under any circumstances.

The battery pack can explode, leak or catch on fire if heated or exposed to fire or high temperatures.

Do not short circuit the battery pack by directly connecting the metal terminals. Be certain that no metal objects such as coins, paper clips, etc., touch the terminals.

Charge the battery pack only with Dash 2500 Patient Monitor's internal charger.

Take out the battery pack if storing for long term; overdischarge might impair the battery.

CAUTIONS

During normal charging or discharging no gases are produced by the battery. In the event of a malfunction that causes overheating or overcharging, individual cells may vent gases to minimize accumulation.

Do not drop this battery pack or subject it to mechanical shock.

Use only batteries recommended by GE Medical Systems *Information Technologies*. Other batteries could result in monitor shut down.

First Use

To condition a new NiMH battery and optimize its performance, plug in the Monitor; the internal battery pack then charges automatically.

NOTE: When you are charging the battery for the first time, the charger may indicate prematurely that charging is complete. This is normal and can happen with all rechargeable batteries when first charged.

Battery Charging

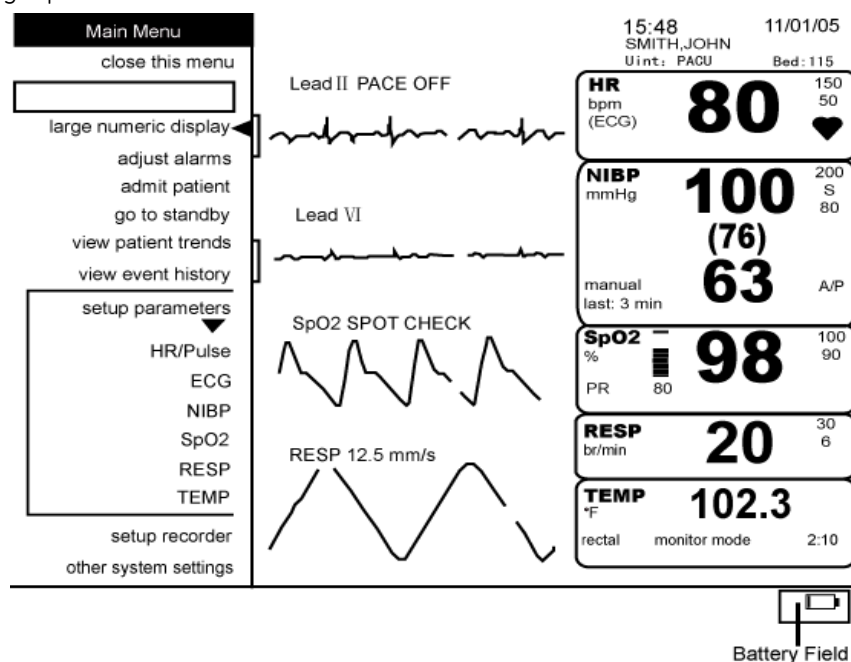
The Dash 2500 Patient Monitor automatically senses if the battery pack needs charging. The battery icon displays the battery condition when the Monitor is operating on battery or if the **Always display battery icon?** option (in the **other system settings** option) is set to **yes**. The NiMH battery pack charges when the Monitor is plugged into an AC power outlet. You do not need to turn on the Monitor.

- Charge battery pack for 12 hours before first use or after prolonged periods of storage.
- If the Monitor is idle for extended periods, it should be at least fully charged and discharged once a month to ensure optimum performance.
- The battery pack should be charged before use, because a charged battery loses charge when left in storage. NiMH batteries discharge to less than 80% of charge within 30 days of storage. Charging is done automatically by the Monitor when it is connected to AC.
- The battery pack should be charged at room temperature (59°F to 86°F; 16°C to 30°C).
- You can charge or top-off the battery pack at any time. You do not have to wait until battery is fully discharged.

NOTE: Before you top-off or charge the battery pack for first time use, make sure you have charged and discharged the battery pack three times in advance.

Battery Icon

The Dash 2500 Patient Monitor displays information concerning the battery (battery presence, battery use, and state of charge,) using an icon in the lower, right portion of the Monitor screen.



The battery icon is always shown when operating from battery power regardless of the **Always display battery icons?** menu setting. You can set the icon to be continuously displayed (even when running on AC power) by choosing **yes** in the **Always display battery icon?** option in the **Other system settings** menu. An up arrow (↑) charge indicator appears next to the battery icon if a battery is being charged. If the battery is being discharged to power the Monitor, a down arrow (↓) charge indicator appears next to it.

When the monitor is running on AC power, if the monitor is not installed with the battery, or there is a defective battery pack or fuse, or depleted battery and the battery is unable to be recharged, the battery icon appears with the outline of the icon in red. When this occurs, you cannot access battery power until the battery has been recharged or replaced or the fuse has been replaced. No other alarms occur, and this event is not entered into the **System Event History** window.

Battery State of Charge

As the battery pack discharges or charges, increments of the charge level change on the battery icon, showing approximate charge status as a percentage.

Fill in Battery Icon	% Battery Charge Status
100% filled	≥ 85% charged
70% filled	≥ 50% and < 85% charged
30% filled	> 15% and < 50% charged
10% filled	≤15% charged, BATTERY LOW alarm sounds; shutdown imminent

Battery Alarm

When generated, the **BATTERY LOW** alarm appears blinking in the alarm message field and the procedural alarm tone is heard. Once the alarm is acknowledged by selecting the **BATTERY LOW** alarm in the *SelectBox*, the Monitor re-arms for the detection of this condition and is automatically reissued every 10 minutes until the Monitor is plugged into AC power.

NOTE: A **BATTERY LOW** alarm will not provide a remote alarm signal.

Loss of Power Shutdown

In the event that the Monitor automatically shuts down due to inadequate AC power and discharged battery, a loud constant tone sounds to alert you that the unit is no longer operating. The alarm sounds for approximately 5 minutes. The Monitor saves all status and trend information, as well as current configuration data before shutdown.

Perform the following steps to recover without affecting current patient settings and data.

- Plug in the power cord into AC outlet.
- Push the **Power** button.
- Continue with the same mode of operation with all operator settings unchanged.

3.6 V Backup Battery

An internal, 3.6 V, rechargeable nickel-metal-hydride battery helps preserve memory when the Monitor is off. This battery is normally not used and will last for 3 years. It must be changed by a qualified service person.

Disposal of Batteries

Batteries

CAUTION

Do not incinerate batteries.

The nickel-metal hydride rechargeable batteries contain no lead, lithium, or cadmium and can be recycled. The U.S. EPA has not provided any specific regulations or guidelines for the waste management of sealed nickel-metal hydride cells or batteries. As a result, a number of states and local governments have passed or are considering legislation which may require special procedures for the disposal of these batteries. Thus, state and local agencies should be contacted for their waste management guidelines. Internationally, procedures for waste management may vary from country to country.

In the absence of regulations or guidelines, the following is recommended for recycling and disposing of used nickel-metal hydride batteries:

- **Recycling:**
GE Medical Systems *Information Technologies* encourages the recycling of nickel-metal hydride batteries. As recycling programs are implemented for nickel-metal hydride batteries, your GE Medical Systems *Information Technologies* representative will be informed of such programs and will have further information.
- **Disposal:**
Individual batteries can be disposed of with other household wastes. When 10 or more batteries are accumulated, the commercial user may want to consider disposing the batteries in a secure waste landfill. Since these batteries are not classified as a "hazardous waste," they can be shipped to the secure waste facility as "nonhazardous waste."

Local regulations, which specify other methods for the disposal of nickel-metal hydride batteries, supersede these recommendations. Waste management companies can provide assistance for the disposal of these batteries. As

Battery: Specifications

previously stated, nickel-metal hydride batteries should not be disassembled, opened, or shredded. Do not short circuit the terminals.

The nickel-metal hydride battery supplied is recognized by the regulatory agencies as a "dry battery." As such, it is not subject to regulation and can be shipped in normal packaging and transported on any mode of transportation without special handling.

The 3.6 volt nickel-metal hydride, rechargeable, memory backup battery contains no lead, lithium, or cadmium compounds. Discharge this battery prior to disposal. Place the battery in packaging which electrically isolates its contents. Do not puncture or place the battery in a trash compactor. Do not incinerate the battery or expose it to fire or high temperatures.

Specifications

Specifications	
Capacity	8.4 V; 7.0 amp-hr
Battery Life	greater than 180 minutes using fully charged internal battery (NIBP: 5-min auto cycle with adult cuff. ECG, RESP, SpO ₂ : Active. TEMP: predictive mode. Printer: printing 2 waveforms for 1 min every 20 min at 25 mm/sec.)
Charge time	4 hours maximum with the Monitor switched off 8 hours maximum with the Monitor switched on

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local GE Medical Systems *Information Technologies* representative.

The *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001), which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The battery does not work or does not last very long.

CAUSE:

- ◆ Has the battery been charged?
- ◆ Has the battery been in storage or a nonuse condition for a few months?
- ◆ Is the battery installed properly?
- ◆ Was the battery over discharged when it was last used?

SOLUTION:

- ◆ New batteries must be charged before use. Refer to Battery Charging in this section.
- ◆ Upon first use or when battery has been removed from prolonged storage, you need to charge and discharge your battery up to three times before optimum performance.

PROBLEM: The battery only charged for a short period of time before indicating full charge.

CAUSE:

- ◆ Are you charging the battery for the first time?

SOLUTION:

- ◆ When you charge your battery for the first time, your charger may indicate prematurely that charging is completed. This often happens with rechargeable batteries. Discharge the battery and repeat the charging procedure.

PROBLEM: The battery will not charge.

CAUSE:

- ◆ Are you trying to charge the battery in unusually cold or hot temperatures?

SOLUTION:

- ◆ Charging the battery should be done at a basic room temperature of 59°F (16°C) to 86°F (30°C). Slowly bring the battery to the basic room temperature before charging. Batteries can be fully charged only when their internal temperatures are between 57°F (15°C) and 109°F (40°C).

PROBLEM: The **BATTERY LOW** alarm appears in the alarm message field, the battery icon turns red, and the amber LED light flashes.

CAUSE:

- ◆ The battery is unable to recharge.

SOLUTION:

- ◆ The battery needs to be recalibrated or is defective. To recalibrate, simply recharge the battery by plugging the Monitor into AC power. The recharge time may vary depending upon the current battery charge status.

Alarms

Battery Alarm		
Name of Alarm	Cause	Response
BATTERY LOW	remaining life in battery has reached 15%	message appears in the alarm message field; once alarm is acknowledged, the Monitor re-arms for the detection of this condition after 10 minutes have elapsed

A Connections

Connections:

For your notes

Data Connections

The Dash 2500 Patient Monitor has two communications connectors for remote data access: Communication Adaptor Connector or Host Port Connector. Please contact a service engineer from GE Medical Systems *Information Technologies* if you want to use the communications connectors.

Dash 2500 network module

The Dash 2500 network module provides network communications between individual Dash 2500 patient monitors and the nurse's central station. This allows the patient's vital signs to be monitored from the CIC.

The Dash 2500 network module is installed inside the interface cover. The left connector provides a 10 Mbps Ethernet connection. The right RJ-45 connector provides isolated RS-232/422 communication for software downloading; these two connectors are visible through the interface cover when it is in place.

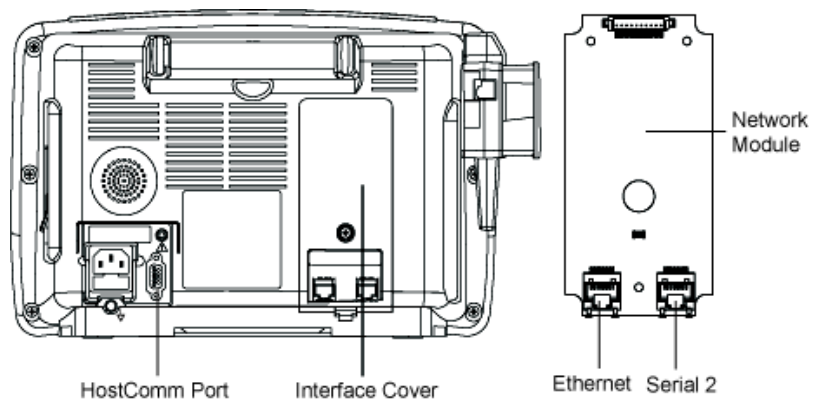
NOTE: The Dash 2500 network module is compatible with CIC version 4.0.8, 4.1.1, 5.0.8, 5.1.0 and all of other versions which are compatible with these four. For compatibility with later versions, check with your local sales representative.

Interface Cover

The removable cover is secured to the Monitor through hinge-type latches at the top of the cover and a Phillips-head screw at the bottom center of the cover. Above the screw are two openings intended for connector access (without removing the cover).

To remove the Interface Cover:

1. Loosen the screw.
2. Remove the cover off the Monitor.



Displayed Data

The chart below gives some general information as to what data is available to the CIC and how it is handled (trending, alarm broadcast, etc.).

Parameter: Sub-parameter	Displayed on CIC Screen	Trended on CIC	Alarm Broadcast	Prints to Network Printer from Dash 2500
ECG: Waveform	✓		✓	✓
ECG: HR	✓	✓	✓	✓
RESP: Waveform	✓			✓
RESP: Rate	✓	✓	✓	✓
SpO2: Waveform	✓			✓
SpO2: Saturation	✓	✓	✓	✓
SpO2: Rate	✓	✓	✓	✓
NIBP: Systolic	✓	✓	✓	
NIBP: Diastolic	✓	✓	✓	
NIBP: MAP	✓	✓	✓	
NIBP: HR		✓	✓	
TEMP	✓	✓		

Alarms

In all cases, the alarm settings listed in the table below are in addition to the settings described in the former chapters. The alarm levels and limits can only be set in the Dash 2500 patient monitor. Alarm levels viewed at the CIC are displayed as in the following table:

Alarm display	Alarm priority name			
CIC	Crisis	Warning	Advisory	Message
Dash 2500	Crisis	Warning	Procedural	Message

NOTE: Alarms must be silenced at the Dash 2500 patient monitor. Alarms cannot be silenced at the central station. The delay time of alarm condition from Dash 2500 monitor to CIC is less than 5 seconds.

Alarm Mapping

The alarm mapping table that follows describes how alarm conditions appear respectively on the Dash 2500 monitor, parameter area at the CIC, broadcast alarm at the CIC, waveform area at the CIC.

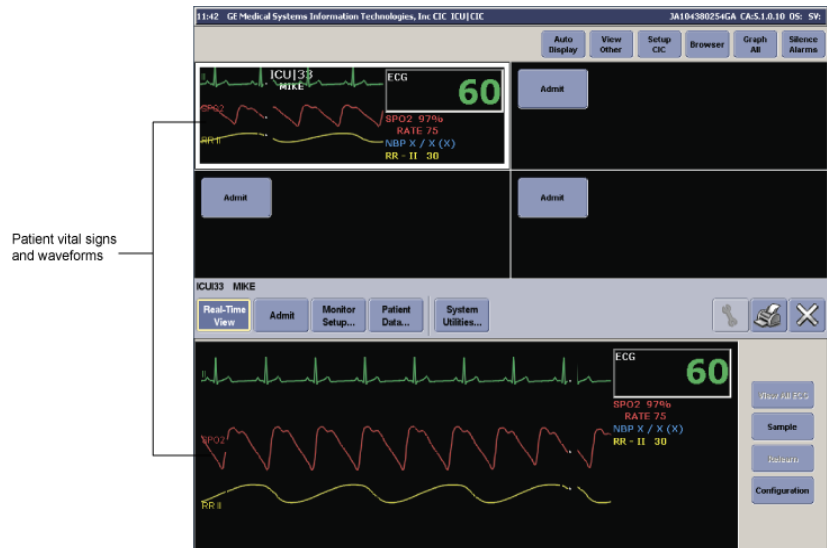
Alarm Mapping			
Alarm Condition	Parameter Area @ CIC	Broadcast Alarm @ CIC	Waveform Area @ CIC
ECG Asystole	Red 0	ASYSTOLE	ASYSTOLE
ECG Primary Lead Fault	X	LEADS FAIL	Waveform Removed
ECG Replace Electrodes	X	LEADS FAIL	No Message
ECG Artifact (Arr Det On)	X	ARRHY SUSPEND	ARRHY SUSPEND
ECG Artifact (Arr Det Off)	X	ARTIFACT	ARTIFACT
ECG Parameter Fatal	Removed	N/A	Waveform Removed
ECG VFIB/VTACH	Red #	VFIB/VTAC	VFIB/VTAC
ECG Vtach	Normal	V TACH	V TACH
ECG HR Limit Hi	Red #	HR HI #	No Message
ECG HR Limit Lo	Red #	HR LO #	No Message
Arrhythmia Monitoring Off	Normal	No Alarm	ARR OFF
ECG No Alarm	Normal	No Alarm	No Message
NIBP Systolic High	Red Block	NBP S HI #	N/A
NIBP Systolic Low	Red Block	NBP S LO #	N/A
NIBP Map High	Red Block	NBP M HI #	N/A
NIBP Map Low	Red Block	NBP M LO #	N/A
NIBP Diastolic High	Red Block	NBP D HI #	N/A
NIBP Diastolic Low	Red Block	NBP D LO #	N/A
NIBP No Determination	NBP WEAK PULSE	WEAK PULSE	N/A
NIBP Level Timeout	NBP INF. FAIL	INFLATION FAI	N/A

Alarm Mapping			
Alarm Condition	Parameter Area @ CIC	Broadcast Alarm @ CIC	Waveform Area @ CIC
NIBP Total Timeout	NBP TIME LIMIT	NBP MAX TIME	N/A
NIBP Pump Timeout	NBP INF. FAIL	INFLATION FAI	N/A
NIBP Overpressure	NBP HI PRESSURE	NBP OVER PRES	N/A
NIBP Parameter Fatal	Removed	N/A	N/A
NIBP HR Limit Hi	Red Block	RATE HI	N/A
NIBP HR Limit Lo	Red Block	RATE LO	N/A
NIBP NO Alarm	Normal	No Alarm	N/A
SpO ₂ High	Red Block	SpO ₂ HI #	No Message
SpO ₂ Low	Red Block	SpO ₂ LO#	No Message
SpO ₂ PR High	Red Block	RATE HI #	No Message
SpO ₂ PR Low	Red Block	RATE LO #	No Message
SpO ₂ Lost Pulse	SpO ₂ PROBE	PULSE SEARCH	Waveform Removed
SpO ₂ Sensor Disconnected	SpO ₂ PROBE	SpO ₂ SENSOR	Waveform Removed
SpO ₂ Sensor Off	SpO ₂ PROBE OFF	SpO ₂ PROBE	No Message
SpO ₂ Parameter Fatal	Removed	N/A	Waveform Removed
SpO ₂ HR Hi	Red Block	RSP HI #	No Message
SpO ₂ HR Low	Red Block	RSP LO#	No Message
SpO ₂ No Alarm	Normal	No Alarm	No Message
Resp High	Red Block	RSP HI #	No Message
Resp Low	Red Block	RSP LO#	No Message
Resp Artifact	ARTIFACT	ARTIFACT	No Message
Resp Baseline Saturation	ARTIFACT	ARTIFACT	No Message
Resp Lead Fail	LD X FAIL	LD X FAIL	No Message
Resp Rate Approaching HR	ARTIFACT	ARTIFACT	No Message

Alarm Mapping			
Alarm Condition	Parameter Area @ CIC	Broadcast Alarm @ CIC	Waveform Area @ CIC
Resp Parameter Fatal	Removed	N/A	Waveform Removed
Resp No Alarm	Normal	No Alarm	No Message
Temp Disconnected	eT T1 SENSOR	N/A	N/A
Temp Bad Probe	eT T1 SENSOR	N/A	N/A
Temp Too Hot	eT T1 SENSOR	N/A	N/A
Temp Parameter Fatal	Removed	N/A	N/A
Temp No Alarm	Normal	No Alarm	N/A

FAQs

How does the patient information from the Dash 2500 screen look on the CIC screen?



How does the CIC allow me to interact with the Dash 2500?

When viewing the Dash 2500 monitor from the CIC, you can perform the following operations:

- Discharge patient: Select **Admit** tab, and choose **Discharge** button
NOTE: CIC can learn new patient automatically. Admit/discharge patient will take the network module several minutes to reset, in this period network function is not available.
- Change patient name: Select **Admit** tab, and fill the patient information then choose **Save** button
- Set up printer: Select **Monitor Setup** tab, select **Graph Setup** tab then configure settings



When I enter a patient's full name on the CIC, why does it become automatically truncated?

The Dash 2500 monitor can accept a patient name up to 20 characters. Whatever truncation occurs on the Dash 2500 monitor is reflected on the CIC, display the first 13 characters.

How to identify the duplicate bed number in CIC?

Duplicated Unit/Bed will cause chaos in Unity network. When a duplication is detected while a Dash 2500 monitor is admitted into Unity network, this newly admitted monitor will automatically change its bed number to 'Dxx' (the xx is a two-digit number starts from 01). So when the bed number 'Dxx' is found on either CIC or Dash 2500 monitor, the user shall check and manually change the monitor's bed number to another unique bed number in this care unit, then power recycle the monitor.

NOTES

- Do not set the Bed number 'Dxx' at any time, it's reserved as a signal for duplicate situation.
- Do not leave Unit number and Bed number as blank in monitor. Or else, the blank Unit/Bed number will be displayed as 'nunit', 'noname' on CIC. It is recommended to always pre-set Unit/Bed number on Dash 2500 monitor in the configuration mode for each patient type. Please refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

How do I print to a network printer from the Dash 2500 monitor?

The CIC allows you to print to network printers from the Dash 2500 monitor. Once the **graph setup** tab has been configured in the CIC, select **print to CS** in **Other System Settings** menu on the Dash 2500 monitor.

NOTE: You cannot print from the CIC to the Dash 2500 monitor.

Why do the temperature values in the CIC vary from the Dash 2500 monitor?

Temperature values in degrees Fahrenheit on the CIC may vary slightly from the displayed value on the Dash 2500 monitor due to the conversion process.

What does a flashing red MAP value on the float display mean?

A flashing red MAP # in the parameter area at the float display can indicate either a NIBP MAP limit alarm or an NIBP HR limit alarm. Refer to the Dash 2500 monitor to determine which alarm condition exists.

What happens to patient trends on the Dash 2500 monitor if a patient is admitted remotely?

Any patient trends are lost when a remote admit patient is performed. If you wish to ensure that patient trends collected in a discharged mode are retained, perform the **admit patient** on the Dash 2500 monitor and select **retain trends**.

Why don't I see NIBP HR trended?

The CIC trends NIBP-derived heart rate in the **Vital Signs** tab only when no other HR source is active.

Why don't I see each stat NIBP value trended?

The CIC only trends one NIBP determination value per minute; therefore, when the Dash 2500 monitor is in stat mode, multiple determinations will not be recorded on the CIC in vital signs or graphic trends.

What CIC features are not supported remotely?

Real-Time View tab:

- Relearn button is unselectable

ECG tab:

- Size is always 1x
- Pacer Detection always reflects the current setting of the monitor
- ST is always off
- Relearn button is unselectable

SpO₂/Resp tab:

- SpO₂ Rate is always on
- SpO₂ Size is always 1x
- Respiration Size is unselectable
- ARTIFACT Alarm is always off
- Relearn button is unselectable

Pressures tab:

- Clear Message button is unselectable

Alarm Control tab:

- Alarm limits and priorities always reflect the current setting of the monitor

Communication Adaptor Connector

The connector provides isolated RS-232 communication for software upgrade and service use. Refer to the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001) for more information.

Auxiliary Output

The auxiliary output is a nonisolated signal input/output meant only for connection to another medical device that is compliant with IEC 60101-1. Connection to a noncompliant device could result in a safety risk by exceeding current limits.

The auxiliary output connector provides an analog ECG waveform output. The analog ECG waveform signal is a high level (1 V/mV) representation of the primary lead. The connector is a two-conductor 3.5 mm stereo jack that mates with a 3.5 mm stereo plug (Shogyo SPY 1011, Shogyo SPY 1012, or equivalent). Cable construction should be shielded, three conductor with PVC insulation or equivalent insulating material.

Pin Out:		
	Tip	No Connection
	Ring	ECG Analog Output
	Sleeve	Signal Return
	Dynamic range	$\pm 4.75V$ minimum
	Scale Factor*	1 V/mV $\pm 5\%$
	Output Impedance/Short Circuit Protection	$<100 \Omega$
	Frequency Response	0.05 Hz - 100 Hz $\pm 1/-6$ dB
	Delay**	22 ± 5 ms
* Maximum load of 50 k Ω necessary to maintain scale factor. ** Internal pacemaker pulses are not represented in the auxiliary output.		

B Accessories

For your notes

Accessories

Use only accessories recommended by GE Medical Systems *Information Technologies*. Failure to use recommended accessories may result in inaccurate readings, damage to equipment, or even accidents. Perform regular functional testing of each of the parameters, using the accessories supplied with the Dash 2500 Monitor.

Part Description	Part Number
Premium Thermal Recording Paper	
PAPER, ECG, PREMIUM THERMAL, 2 IN., DDW, 48 ROLL/CS	9402-046
Multi-Link Patient Cables	
CABLE ASSY, ECG 3-LEAD W/GRAB, AHA	2021141-001
CABLE ASSY, ECG 3-LEAD W/GRAB, IEC	2021141-002
CABLE ASSY, 3-/5-LEAD ESU MULTLNK ECG, AHA	2022948-001
CABLE ASSY, 3-/5-LEAD, ESU, MULTILINK ECG, IEC	2022948-002
CABLE ASSY, ECG MLT-LNK, 3-/5-LEAD, 3.6 M, AHA	2017003-001
CABLE ASSY, ECG MLT-LNK, 3-/5-LEAD, 3.6 M, IEC	2017003-003
CABLE ASSY, ECG 3-LEAD, NEO, 3.6 M, AHA	2017004-001
CABLE ASSY, ECG 3-LEAD, NEO 3.6 M, IEC	2017004-003
Multi-Link Leadwire Sets (Individually Replaced)	
LEADWIRE SET, ECG, MULTI-LINK, 5-LEAD GRAB, AHA, 29 IN., 5/SET	414556-001
LEADWIRE SET, ECG, MULTI-LINK, 5-LEAD GRAB, IEC, 73 CM, 5/SET	414556-003
LEADWIRE SET, ECG, MULTI-LINK, 5-LEAD GRAB, AHA, MIXED, 5/SET	414556-005
LEADWIRE SET, ECG, MULTI-LINK, 5-LEAD GRAB, IEC, MIXED, 5/SET	414556-006
LEADWIRE SET, ECG, MULTI-LINK, MINI-CLIP/DIN, NEO, AHA, 24 IN., 3/SET	900716-001
LEADWIRE SET, ECG, MULTI-LINK, MINI-CLIP/DIN, NEO, IEC, 61 CM	900716-002
Blood Pressure Cuffs	
Dura-Cuf® Blood Pressure Cuffs, Dual-Tube, Screw Connector	
CUFF, NIBP, DURA-CUF, INF, 2 TB, ORG, SUBMIN, 5/BOX	002200
CUFF, NIBP, DURA-CUF, CHD, 2 TB, GRN, SUBMIN, 5/BOX	002201
CUFF, NIBP, DURA-CUF, SM AD, 2 TB, ROYAL BLU, SUBMIN, 5/BOX	002202
CUFF, NIBP, DURA-CUF, AD, 2 TB, NAVY, SUBMIN, 5/BOX	002203
DURA-CUF CUFF, NIBP, DURA-CUF, AD LONG, 2 TB, NAVY, SUBMIN CONNECTOR, 5/BOX**	002206

Part Description	Part Number
DURA-CUF CUFF, NIBP, DURA-CUF, LARGE AD 2 TB, WINE, SUBMIN CONNECTOR, 5/BOX**	002204
DURA-CUF CUFF, NIBP, DURA-CUF, LARGE AD LONG 2 TB, WINE, SUBMIN CONNECTOR, 5/BOX**	002207
DURA-CUF CUFF, NIBP, DURA-CUF, THIGH 2 TB, WINE, SUBMIN CONNECTOR, 5/BOX**	002205
DURA-CUF ASSORTMENT PACK, 2-TUBE SUBMIN CONNECTOR, 1 EA, CUFF: INFANT, CHILD, SM/REG/ LG ADULT, THIGH, 6/BOX**	2299
DURA-CUF CHILE ASSORTED, 2-TUBE SUBMIN CONNECTOR, ASSORTED COLORS: 2 INFANT, 3 CHILD, 1SM. ADULT, 6/BOX**	2296
DURA-CUF CHILE ASSORTED, 2-TUBE SUBMIN CONNECTOR, ASSORTED COLORS: 1SM. ADULT, 2 ADULT, 1 ADULT LONG, 1 LG ADULT, 1 LG ADULT LONG, 6/BOX**	2297
DURA-CUF CUFF, INFANT, 2-TUBE SCREW CONNECTOR, RUST, 5/BOX**	002783
DURA-CUF CUFF, CHILD, 2-TUBE SCREW CONNECTOR, GREEN, 5/BOX**	002781
DURA-CUF CUFF, SMALL ADULT, 2-TUBE SCREW CONNECTOR, ROYAL BLUE, 5/BOX**	002779
DURA-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR (W/HANGER), NAVY, 5/BOX**	002771
DURA-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR, NAVY, 5/BOX**	002774
DURA-CUF CUFF, ADULT LONG, 2-TUBE SCREW CONNECTOR, NAVY, 5/BOX**	002772
DURA-CUF CUFF, LARGE ADULT, 2-TUBE SCREW CONNECTOR, WINE, 5/BOX**	002791
DURA-CUF CUFF, LARGE ADULT LONG, 2-TUBE SCREW CONN, WINE, 5/BOX**	002784
DURA-CUF CUFF, THIGH, 2-TUBE SCREW CONNECTOR, BROWN, 5/BOX**	002796
DURA-CUF ASSORTMENT PACK, VARIOUS SIZES, 2-TUBE SCREW CONNECTOR, ASS'TD COLORS, 6/ BOX**	002699
DURA-CUF CHILD ASSORTMENT PACK, 2-TUBE SCREW CONNECTOR, ASS'TD COLORS, 6/BOX**	002697
DURA-CUF ADULT ASSORTMENT PACK, 2-TUBE SCREW CONNECTOR, ASS'TD COLORS, 6/BOX**	002698
NEONATAL Classic-Cuf® Blood Pressure Cuffs, Dual-Tube, Male Slip Connectors	
CUFF, NIBP, CLASSIC-CUF, NEO ASSORTMENT, 2TB, M SLIP: 2 SIZE 1, 3 SIZE 2, 5 SIZE 3, 5 SIZE 4, 5 SIZE 5 WHT, 20/BX	2693
Blood Pressure Tubing (Air Hoses)	
AIR HOSE, NIBP, ADULT, 3.6 M, Sub-Miniature Connectors	2017008-001
AIR HOSE, NIBP, ADULT, 1.2 M, Sub-Miniature Connectors	2017008-002
AIR HOSE, NIBP, ADULT, 3.6 M, Screw Connectors**	2017008-003
AIR HOSE, NIBP, ADULT, 1.2M, Screw Connectors**	2017008-004

Part Description	Part Number
AIR HOSE, NIBP, NEONATAL, 2.4 M	2017009-001
AIR HOSE, NIBP, NEONATAL, 1.2 M	2017009-002
AIR HOSE, NIBP, NEONATAL, 3.6 M	2017009-003
Blood Pressure Starter Kits	
NIBP STARTER KIT, NEONATAL, 2.4 M	2032308-001
NIBP STARTER KIT, PEDIATRIC, 3.6 M	2032308-002
NIBP STARTER KIT, ADULT, 3.6 M	2032308-003
NIBP STARTER KIT, NEO-CLASSIC, 2.4 M	2032308-004
SPO2, Masimo Interface Cables	
CABLE, MASIMO, LNC-10 GE CONNECTOR	2027263-002
CABLE ASSY SPO2 MASIMO, 2.4 M	2017002-003
SPO2, Masimo Reusable Sensors	
SENSOR LNCS DC-1 ADULT REUSABLE EA	2027258-001
SENSOR LNCS DC-1P PED REUSABLE EA	2027259-001
SENSOR LNCS TC-1 TIP-CLIP EAR REUSABL EA	2027261-001
SENSOR, SPO2, MASIMO, PEDIATRIC, REUSABLE	2002799-001
SENSOR, SPO2, MASIMO, FINGER, AD, REUSABLE	2002800-001
SENSOR, MASIMO, DC-I (BUNDLED)	2025140-001
SPO2, Masimo Adhesive Sensor	
MASIMO SPO2-SENSOR, LNOP-PDT - PED.- ADH (20/BOX)	2010459-001
MASIMO SPO2-SENSOR, LNOP-NEO - NEO- ADH (20/BOX)	2010460-001
SENSOR LNCS ADULT ADHESIVE 20/BX	2027253-001
SENSOR LNCS PED ADHESIVE 20/BX	2027254-001
SENSOR LNCS INFANT ADHESIVE 20/BX	2027255-001
SENSOR LNCS NEONATAL ADHESIVE 20/BX	2027256-001
SENSOR LNCS NEOPT NEONATAL ADHSV 20/BX	2027257-001
SPO2, Nellcor Interface Cables	
CABLE ASSY SPO2 NELLCOR OXIMAX 3 M	2021406-001
SPO2, Nellcor Reusable Sensors	
SPO2- SENSOR, DS 100A	70124021
DURASENSOR ADULT DS-100A INDV	407705-006

Part Description	Part Number
SPO2, Nellcor Adhesive Sensor	
SENSOR, SPO2, NELLCOR OXISENSOR, NEO, DISPOSABLE, 24/CS	407705-001
SENSOR, SPO2, NELLCOR OXISENSOR, DIGITAL, INF, DISPOSABLE, 24/CS	407705-002
SENSOR, SPO2, NELLCOR OXISENSOR, DIGITAL, PED, DISPOSABLE, 24/CS	407705-003
SENSOR, SPO2, NELLCOR OXISENSOR, DIGITAL, AD, DISPOSABLE, 24/CS	407705-004
Reusable Single Thermistor (ALARIS) Temperature Probes	
SENSOR TURBO TEMP LONG, WHITE CORD	2008774-001
SENSOR TURBO TEMP LONG RECTAL, WHITE CORD	2008775-001
THERMISTOR (ALARIS) TEMPERATURE PROBE COVERS	
PROBE COVERS 20/BOX	615118
Disposable ECG Electrodes*	
ELCTD, ADULT DSPL, BULK 30/BOX	9431-003
SILVERTRACE DISPOSABLE, PEDIATRIC ECG ELECTRODES, CLOTH RECTANGLE, SOLID GEL	900690-403
SILVERTRACE DISPOSABLE, NEONATE ECG ELECTRODES, CLOTH RECTANGLE, SOLID GEL	900690-404
SILVERTRACE P40CL DISPOSABLE, ADULT ECG ELECTRODES, CLOTH RECTANGLE, SOLID GEL	2014782-001
Clinical Systems SOFT-CUF® Blood Pressure Cuffs, Dual-Tube **	
SOFT-CUF CUFF, INFANT, 2-TUBE SUB-MINIATURE, ORANGE/WHITE, 20/BX**	2401
SOFT-CUF CUFF, CHILD, 2-TUBE SUB-MINIATURE, GREEN/WHITE, 20/BX**	2402
SOFT-CUF CUFF, CHILD LONG, 2-TUBE SUB-MINIATURE, GREEN/WHITE, 20/BX**	2400
SOFT-CUF CUFF, SMALL ADULT, 2-TUBE SUB-MINIATURE, LT BLUE/WHITE, 20/BX**	2403
SOFT-CUF CUFF, SMALL ADULT LONG, 2-TUBE SUB-MINIATURE, LT BLUE/WHITE, 20/BX**	2407
SOFT-CUF CUFF, ADULT, 2-TUBE SUB-MINIATURE, NAVY/WHITE, 20/BX**	2404
SOFT-CUF CUFF, ADULT LONG, 2-TUBE SUB-MINIATURE, NAVY/WHITE, 20/BX**	2116
SOFT-CUF CUFF, LARGE ADULT, 2-TUBE SUB-MINIATURE, ROSE/WHITE, 20/BX**	2405
SOFT-CUF CUFF, LARGE ADULT LONG, 2-TUBE SUB-MINIATURE, ROSE/WHITE, 20/BX**	2117
SOFT-CUF CUFF, THIGH, 2-TUBE SUB-MINIATURE, BROWN/WHITE, 20/BX**	2406
SOFT-CUF CUFF, ASSORTED, 2-TUBE SUB-MINIATURE, ASS'TD COLORS, 10/BX**	2298
SOFT-CUF CUFF, INFANT, 2-TUBE SCREW CONNECTOR, ORANGE/WHITE**E	2500
SOFT-CUF CUFF, CHILD, 2-TUBE SCREW CONNECTOR, GREEN/WHITE**	2501

Part Description	Part Number
SOFT-CUF CUFF, CHILD LONG, 2-TUBE SCREW CONNECTOR, GREEN/WHITE**	2506
SOFT-CUF CUFF, SMALL ADULT, 2-TUBE SCREW CONNECTOR, LT BLUE/WHITE**	2502
SOFT-CUF CUFF, SMALL ADULT LONG, 2-TUBE SCREW CONNECTOR, LT BLUE/WHITE**	2507
SOFT-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR, NAVY/WHITE**	2503
SOFT-CUF CUFF, ADULT LONG, 2-TUBE SCREW CONNECTOR, NAVY/WHITE**	2604
SOFT-CUF CUFF, LARGE ADULT, 2-TUBE SCREW CONNECTOR, ROSE/WHITE**	2504
SOFT-CUF CUFF, LARGE ADULT LONG, 2-TUBE SCREW CONNECTOR, ROSE/WHITE**	2644
SOFT-CUF CUFF, THIGH, 2-TUBE SCREW CONNECTOR, BROWN/WHITE**	2505
SOFT-CUF CUFF, ASSORTED, 2-TUBE SCREW CONNECTOR, ASS'TD COLORS**	002695
SOFT-CUF CUFF, NEO #1, 2-TUBE NEO - MALE SLIP LUER, ORANGE FISH, 20/BOX**	2521
SOFT-CUF CUFF, NEO #2, 2-TUBE NEO - MALE SLIP LUER, BLUE BUNNY, 20/BOX**	2422
SOFT-CUF CUFF, NEO #3, 2-TUBE NEO - MALE SLIP LUER, GREEN DUCK, 20/BOX**	2523
SOFT-CUF CUFF, NEO #4, 2-TUBE NEO - MALE SLIP LUER, BLUE DOG, 20/BOX**	2524
SOFT-CUF CUFF, NEO #5, 2-TUBE NEO - MALE SLIP LUER, RED DINOSAUR, 20/BOX**	2525
SOFT-CUF CUFF, NEO ASSORTED, 2-TUBE NEO - MALE SLIP LUER, ASS'TD COLORS, 20/BOX**	2694
Clinical Systems SENSACUF® Blood Pressure Cuffs, Dual-Tube**	
SENSA-CUF CUFF, INFANT, 2-TUBE SUB-MINIATURE, ORANGE/GREY, 5/BOX**	2482
SENSA-CUF CUFF, CHILD, 2-TUBE SUB-MINIATURE, GREEN/GREY, 5/BOX**	2484
SENSA-CUF CUFF, SMALL ADULT, 2-TUBE SUB-MINIATURE, LT BLUE/GREY, 5/BOX**	2486
SENSA-CUF CUFF, SMALL ADULT LONG, 2-TUBE SUB-MINIATURE 5/BOX**	2487
SENSA-CUF CUFF, ADULT, 2-TUBE SUB-MINIATURE, NAVY/GREY, 5/BOX**	2488
SENSA-CUF CUFF, ADULT LONG, 2-TUBE SUB-MINIATURE 5/BOX**	2489
SENSA-CUF CUFF, LARGE ADULT, 2-TUBE SUB-MINIATURE, ROSE/GREY, 5/BOX**	2490
SENSA-CUF CUFF, LARGE ADULT LONG, 2-TUBE SUB-MINIATURE 5/BOX**	2491
SENSA-CUF CUFF, THIGH, 2-TUBE SUB-MINIATURE, BROWN/GREY, 5/BOX**	2492
SENSA-CUF CUFF, INFANT, 2-TUBE SCREW CONNECTOR, ORANGE/GREY, 5/BOX**	2458
SENSA-CUF CUFF, CHILD, 2-TUBE SCREW CONNECTOR, GREEN/GREY, 5/BOX**	2460

Part Description	Part Number
SENSA-CUF CUFF, SMALL ADULT, 2-TUBE SCREW CONNECTOR, LT BLUE/GREY, 5/BOX**	2462
SENSA-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR, NAVY/GREY, 5/BOX**	2464
SENSA-CUF CUFF, LARGE ADULT, 2-TUBE SCREW CONNECTOR, ROSE/GREY, 5/BOX**	2466
SENSA-CUF CUFF, THIGH, 2-TUBE SCREW CONNECTOR, BROWN/GREY, 5/BOX**	2468
SENSA-CUF CUFF, ASSORTED, 2-TUBE SCREW CONNECTOR, ASSORTED COLORS, 3/BOX**	2494
Clinical Systems CLASSIC-CUF® Blood Pressure Cuffs, Dual-Tube**	
CLASSIC-CUF CUFF, INFANT, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2354
CLASSIC-CUF CUFF, CHILD, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2355
CLASSIC-CUF CUFF, SMALL ADULT, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2356
CLASSIC-CUF CUFF, ADULT, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2357
CLASSIC-CUF CUFF, ADULT LONG, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2352
CLASSIC-CUF CUFF, LARGE ADULT, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2358
CLASSIC-CUF CUFF, LARGE ADULT LONG, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2353
CLASSIC-CUF CUFF, THIGH, 2-TUBE SUB-MINIATURE, WHITE, 20/BX**	2359
CLASSIC-CUF CUFF, ASSORTED, 2-TUBE SUB-MINIATURE, WHITE, 10/BX**	2292
CLASSIC-CUF CUFF, INFANT, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2670
CLASSIC-CUF CUFF, CHILD, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2671
CLASSIC-CUF CUFF, SMALL ADULT, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2672
CLASSIC-CUF CUFF, ADULT, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2673
CLASSIC-CUF CUFF, LARGE ADULT, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2674
CLASSIC-CUF CUFF, THIGH, 2-TUBE SUB-MIN, YELLOW, 20/BOX**	2675
CLASSIC-CUF CUFF, INFANT, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2650
CLASSIC-CUF CUFF, CHILD, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2651
CLASSIC-CUF CUFF, SMALL ADULT, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2607
CLASSIC-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2602
CLASSIC-CUF CUFF, LARGE ADULT, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2642
CLASSIC-CUF CUFF, THIGH, 2-TUBE SCREW CONNECTOR, YELLOW, 20/BOX**	2652

Part Description	Part Number
CLASSIC-CUF CUFF, INFANT, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2618
CLASSIC-CUF CUFF, CHILD, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2613
CLASSIC-CUF CUFF, SMALL ADULT, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2608
CLASSIC-CUF CUFF, ADULT, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2603
CLASSIC-CUF CUFF, ADULT LONG, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2647
CLASSIC-CUF CUFF, LARGE ADULT, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2643
CLASSIC-CUF CUFF, LARGE ADULT LONG, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2649
CLASSIC-CUF CUFF, THIGH, 2-TUBE SCREW CONNECTOR, WHITE, 20/BOX**	2648
CLASSIC-CUF CUFF, NEO #1, 2-TUBE NEO - MALE SLIP LUER, WHITE, 20/BOX**	2638
CLASSIC-CUF CUFF, NEO #2, 2-TUBE NEO - MALE SLIP LUER, WHITE, 20/BOX**	2633
CLASSIC-CUF CUFF, NEO #3, 2-TUBE NEO - MALE SLIP LUER, WHITE, 20/BOX**	2628
CLASSIC-CUF CUFF, NEO #4, 2-TUBE NEO - MALE SLIP LUER, WHITE, 20/BOX**	2623
CLASSIC-CUF CUFF, NEO #5, 2-TUBE NEO - MALE SLIP LUER, WHITE, 20/BOX**	2619
GCX mounting	
ROLLSTAND, PRO1000, GCX VERSION	2033904-001
MOUNT , WALL, DP 1000 SERIES MONITORS	CR-0013-02
MOUNT WALL CHANNEL 7IN NON-SEISMIC	2030517-001
25" WALL CHANNEL MOUNT	416537-006
31" WALL CHANNEL MOUNT	416537-012
MOUNT, BED RAIL HANGER,MONITOR	2040085-001
MOUNT,WALL	2040400-001
*Use only standard silver-silver chloride (Ag-AgCl) ECG electrodes. Use connections meeting AAMI standards. **Only for US marketing use. Three-electrode cables that internally connect LL to RL or LA to RL should not be used. Such a cable would connect the LL or LA signal to the RL circuitry, interfering with normal operation.	

C EMI Considerations

For your notes

Electromagnetic Interference (EMI) Considerations

Electromagnetic energy that unintentionally affects the operation of another electrical device is called electromagnetic interference (EMI). One form of electromagnetic energy that can produce EMI is radio waves. Radio waves are emitted from the antennas of cellular phones, citizens band radios, mobile two-way radios (like those used in police, fire, and emergency vehicles), hand-held two-way radios, radio stations, TV stations, amateur radio (ham) transmitters, wireless computer links, microwave sources, and paging transmitters. Because the intensity of electromagnetic energy is greatest near the source (transmitting antenna), EMI from mobile radios is of special concern. The source of EMI caused by radio waves may be difficult to determine since radio waves are invisible and the signals may be intermittent.

To reduce the risk of EMI, follow these recommendations:

- Do not turn on or use hand-held personal communications devices, such as mobile two-way radios and cellular phones, near the Monitor.
- In the case of unexplained EMI, consider the locations of nearby transmitters such as radio or TV stations. You may have to move the Monitor or place shield material between the transmitter and the Monitor.
- Be aware that modifying this monitor or adding accessories or components not specifically authorized by GE Medical Systems *Information Technologies* may make the Monitor more susceptible to interference from radio waves.
- When servicing the Monitor, use only replacement components authorized by GE Medical Systems *Information Technologies* and be sure to replace all shields, screws, and gaskets, in their exact locations as described in the *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001).
- Do not put paint or labels over any metallic surfaces that have been left bare for continuity of shielding.

CAUTION

Caution: Operation in proximity of microwave oven may cause loss of data when using wireless technology.

D Maintenance

For your notes

Assistance and Parts

If the product malfunctions or if assistance, service, or spare parts are required, contact GE Medical Systems *Information Technologies* Technical Support. GE Medical Systems *Information Technologies* provides an assembly exchange service. Before contacting GE Medical Systems *Information Technologies*, it is helpful for you to duplicate the problem and check and confirm the operation of all accessories to ensure that they are not the cause of the problem.

WARNING

There are no user-serviceable parts inside the Dash 2500 Patient Monitor. Refer all servicing to qualified personnel.

When calling, please have the following information at hand:

- ◆ product name and model number and complete description of the problem
- ◆ the serial number of your Monitor
- ◆ your name and address
- ◆ a purchase order number if out-of-warranty repairs or spare parts are required
- ◆ your GE Medical Systems *Information Technologies* account number, if applicable
- ◆ the part number for spare or replacement parts

Maintenance, Cleaning, and Calibration

Discard single-use accessories after use. For maintenance and cleaning instructions, please refer to individual parameter sections in this manual. For calibration instructions, please refer to *Dash 2500 Patient Monitor Service Manual* (PN 2042481-001).

Cleaning the Monitor

WARNING

Unplug the monitor before cleaning and disinfection.

Monitor Exterior

The exterior surfaces of the Dash 2500 Patient Monitor may be cleaned with a dampened, lint-free cloth. Use one of the following approved solutions:

- Mild soap (diluted)
- Commercial diluted bleach solution or bleach wipe, such as Dispatch® Brand Hospital Disinfectant with Bleach Single-Piece Towels
- Commercial diluted ammonia solution
- Wipe off cleaning solutions with a clean, dry cloth

Never use the following cleaning agents:

- Abrasive cleaners or solvents of any kind
- Acetone
- Ketone
- Alcohol-based cleaning agents
- Betadine
- Quaternary ammonium disinfectants such as Virex, Sani-Wipes, Ascepti-Wipes, or products containing similar active ingredients to these should be avoided.
- Cleaning solutions containing wax
- Never pour or spray water or any cleaning solution on the equipment or permit fluids to run behind switches, into connectors, into the recorder, or into any ventilation openings in the equipment.

Display

To clean the display screen, use a soft, clean cloth dampened with a glass cleaner. Never spray the glass cleaner directly onto the display, and never use alcohol or hospital disinfectants like Cidex or Betadine.

Failure to follow these cleaning recommendations may melt, distort, or dull the finish of displays and cases; blur lettering on labels; embrittle cases and lead to cracks and breakage; or cause equipment failures. Use of non-approved cleaning agents is considered abuse and is not covered under warranty.

NOTES

- ◆ Do not use acetone on any part of the Monitor.
- ◆ Do not immerse or spray any liquids directly on the Monitor.
- ◆ Always verify the efficacy of the recommended cleaning agents. GE Medical Systems *Information Technologies* does not guarantee infection control based on the proper usage of these cleaning agents.

Repairs

If your product requires warranty, extended warranty, or non-warranty repair service, contact GE Medical Systems *Information Technologies* Technical Support at 1-800-558-7044 (USA) or contact your local representative.

Estimates for non-warranty repairs are provided at no charge; however, the product must be sent to GE Medical Systems *Information Technologies* for an estimate. To facilitate prompt service in cases where the product has external chassis or case damage, please advise the representative when you call.

The representative will record all necessary information and will provide a Return Authorization Number. Prior to returning any product for repair, a Return Authorization Number must be obtained.

Packaging Material

Retain original packaging materials for future use in storing or shipping the Monitor and accessories. This recommendation includes corrugated shippers and foam/corrugated spacers.

Whenever possible recycle the packaging of accessories and patient applied parts.

Packing Instructions

If you have to return goods for service, follow these recommended packing instructions:

- Remove all hoses, cables, sensors, power cords, and ancillary products from the Monitor before packing.
- Wherever possible use the original shipping carton and packing materials.
- Observe the environmental conditions detailed in the Product Overview section of this manual.

It is recommended that all returned goods be insured. Claims for loss or damage to the product must be initiated by the sender.

Disposal of Product Waste

As you use the Dash 2500 Patient Monitor, you will accumulate solid wastes that require proper disposal or recycling. These include batteries, patient applied parts, and packaging material. Dispose of these materials according to local or national regulations. Refer to the "Battery" section for disposal of batteries.

Patient Applied Parts

Certain patient applied parts, such as those with adhesive (electrodes and disposable SpO₂ sensors), are intended for single use and should be disposed of properly as medical waste. Other patient applied parts, such as blood pressure cuffs should be cleaned according to manufacturer's instructions. Inspect reusable applied parts for wear, replace as necessary, and dispose of used parts as medical waste.

E EMC Compliance

For your notes

Electromagnetic Compatibility (EMC)

Changes or modifications to this system not expressly approved by GE Medical Systems can cause EMC issues with this or other equipment. This system is designed and tested to comply with applicable regulation regarding EMC and must be installed and put into service according to the EMC information stated in this appendix.

WARNING

Use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

WARNING

The equipment or system should not be used adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, the equipment or system should be tested to verify normal operation in the configuration in which it is being used.

Guidance and Manufacturer's Declaration – Electromagnetic Emissions

The Dash 2500 Patient Monitor is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to assure that the Dash 2500 Patient Monitor is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment – Guidance
RF Emissions EN 55011	Group 1	The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions EN 55011	Class A	The equipment is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions EN 61000-3-2	Class A	
Voltage Fluctuations/ Flicker Emissions EN 61000-3-3	Complies	

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Dash 2500 Patient Monitor is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to assure that the Dash 2500 Patient Monitor is used in such an environment.

Immunity Test	EN 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
Electrostatic Discharge (ESD) EN 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical Fast Transient/Burst EN 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power should be that of a typical commercial or hospital environment.
Surge EN 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines EN 61000-4-11	< 5% U_t (> 95% dip in U_t) for 0.5 cycles < 40% U_t (> 60% dip in U_t) for 5 cycles < 70% U_t (> 30% dip in U_t) for 25 cycles < 5% U_t (> 95% dip in U_t) for 5 s	< 5% U_t (> 95% dip in U_t) for 0.5 cycles < 40% U_t (> 60% dip in U_t) for 5 cycles < 70% U_t (> 30% dip in U_t) for 25 cycles < 5% U_t (> 95% dip in U_t) for 5 s	Mains power should be that of a typical commercial or hospital environment. If the user of the equipment requires continued operation during power mains interruptions, it is recommended that the equipment be powered from an uninterruptible power supply or a battery.
Power Frequency (50/60 Hz) Magnetic Field EN 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE:

U_t is the AC mains voltage prior to application of the test level.

Guidance and Manufacturer's Declaration – Electromagnetic Immunity

The Dash 2500 Patient Monitor is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to assure that the Dash 2500 Patient Monitor is used in such an environment.

Immunity Test	EN 60601 Test Level	Compliance Level	Electromagnetic Environment – Guidance
Conducted RF EN 61000-4-6 Radiated RF EN 61000-4-3	3 Vrms 150 KHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 V rms 3 V/m	Portable and mobile RF communications equipment should not be used closer to any part of the equipment, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = 2.3 \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer, and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^a, should be less than the compliance level in each frequency range^b. Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1: At 80 MHz and 800 MHz, the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by reflection from structures, objects, and people. ^aField strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the equipment is used exceeds the applicable RF compliance level above, the equipment should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the equipment. ^bOver the frequency range 150 KHz to 80 MHz, field strengths should be less than 3 V/m.			

Recommended Separation Distances

The table below provides the recommended separation distances (in meters) between portable and mobile RF communications equipment and the Dash 2500 Patient Monitor.

The Dash 2500 Patient Monitor is intended for use in the electromagnetic environment on which radiated RF disturbances are controlled. The customer or the user of the Dash 2500 Patient Monitor can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Dash 2500 Patient Monitor as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power of Transmitter in Watts	Separation Distance in Meters (m) According to Frequency of Transmitter		
	150 kHz to 80 MHz ^a $d = 1.2 \sqrt{P}$	80 MHz to 800 MHz ^a $d = 1.2 \sqrt{P}$	800 MHz to 2.5 GHz ^a $d = 2.3 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
^a At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.			

For transmitters rated at a maximum output power not listed above, the recommended separation distance [d] in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE:

These guidelines may not apply in all instances. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Compliant Cables and Accessories

WARNING

The use of accessories, transducers and cables other than those specified may result in increased emissions or decreased immunity performance of the equipment or system.

The table below lists cables, transducers, and other applicable accessories with which GE Medical Systems claims EMC compliance.

NOTE: Any supplied accessories that do not affect EMC compliance are not included.

Part No	Description	Maximum Lengths
2021141-001	CABLE ASSY ECG 3 LEAD W/GRAB, AHA	
2022948-001	CABLE ASSY 3/5 LEAD ESU MULTLNK ECG, AHA	
2017003-001	CABLE ASSY ECG MLT-LNK 3/5 LEAD, AHA	3.6M
2017004-001	CABLE ASSY ECG 3 LEAD NEO, AHA	3.6M
900716-001	900716-001 Leadwire Set, ECG, Multi-Link, Mini-Clip/ DIN, Neo, AHA, 3/set	24 in.
002200	002200 Cuff, NIBP, Dura-Cuf, Inf, 2 TB, Org, Submin, 5/ bx	
002201	002201 Cuff, NIBP, Dura-Cuf, Chd, 2 TB, Grn, Submin, 5/ bx	
002202	002202 Cuff, NIBP, Dura-Cuf, Sm Ad, 2 TB, Royal Blu, Submin, 5/bx	
002203	002203 Cuff, NIBP, Dura-Cuf, Ad, 2 TB, Navy, Submin, 5/ bx	
2017002-003	CABLE ASSY SPO2 MASIMO	2.4M
2002800-001	2002800-001 Sensor, SPO2, Masimo, Finger, Ad, Reusable	
2021406-001	2021406-001 CABLE ASSY SPO2 NELLCOR OXIMAX	3M
70124021	SPO2- SENSOR DS 100A	
2008774-001	SENSOR TURBO TEMP LONG, WHITE CORD	
2008775-001	SENSOR TURBO TEMP LONG RECTAL, WHITE CORD	
615118	Probe Covers 20/box	

For your notes

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